

**KERTAS-KERTAS
SOALAN PEPERIKSAAN
AKHIR
SEMESTER 1
SESI 2005/2006**

**FAKULTI
KEJURUTERAAN**

KURSUS FAKULTI (KNF)

**FAKULTI
KEJURUTERAAN**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Matematik Kejuruteraan 1
(Engineering Mathematics I)

KNF 1013

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 9 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.30 pm – 5.30 pm
Tempat <i>(Place)</i>	: Dewan Kuliah, CTF1	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: En. Zamri Bin Bujang		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

- a. Write $\ln 27 - 2 \ln \left(\frac{1}{3} \right)$ as a single logarithm. [3 marks]
- b. Evaluate $\sin^{-1} \left(-\frac{1}{2} \right)$ [3 marks]

Question 2

- a. Apply the rules of limits to evaluate $\lim_{x \rightarrow 3} \frac{4x^3 - 9x + 1}{6x^2 + 3}$ [3 marks]
- b. Use L'Hôpital's Rule to evaluate $\lim_{x \rightarrow 3} \frac{x - 3}{x^2 + 4x - 21}$ [4 marks]

Question 3

- a. Compute $\sum_{i=1}^6 3i + 4$ [3 marks]
- b. Find the area under the curve $y = f(x) = 8x - 8x^2$ on the interval $[0, 1]$.

For a Riemann Sums is given as:

$$A = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x. \quad [8 \text{ marks}]$$

Question 4

Find $\frac{dy}{dx}$ for:

- a. $y = 6 \sin 2x + 3x^2 - 5e^{3x}$ [3 marks]
- b. $y = \sqrt{14x + 15}$ [3 marks]

Question 9

Obtain the first 4th order of power series for $\ln(1+x)$ by using Taylor-Maclaurin series. Hence evaluate $\ln(1.02)$ correct to five decimal places.

For a Taylor-Maclaurin's series is given as:

$$f(x) = f(0) + xf'(0) + \frac{x^2}{2!} f''(0) + \frac{x^3}{3!} f'''(0) + \dots \quad [10 \text{ marks}]$$

Question 10

Find the area bounded by the graphs of $y = 2 - x$ and $y = x^2 - 10$. [8 marks]

Question 11

Sketch the graph of $y = 2 \sin x$ and $y = \sin x$. How does $y = 2 \sin x$ differ from the graph of $y = \sin x$? [8 marks]

Question 12

Suppose that a dome has circular cross sections, with outline $y = \sqrt{\frac{25}{2}(50-x)}$ for $0 \leq x \leq 50$ (in units of feet). Find the volume of the dome. Round your answer to the nearest whole number.

The cross-sectional areas is given as:

$$A = \pi r^2 \quad [8 \text{ marks}]$$

Question 5

Express in partial fraction:

a. $\frac{6}{x^2 - 16}$ [4 marks]

b. $\frac{5x^2 + 18x + 7}{x^3 + 2x^2 + x}$ [6 marks]

Question 6

a. Evaluate $\int x^8 \cos x^9 dx$. [3 marks]

b. Determine whether the improper integral $\int_{14}^{15} \frac{1}{x-14} dx$ converges or diverges. [4 marks]

Question 7

a. Express in polar form

i) $4 + 3i$ [3 marks]

ii) $1 + 4i$ [3 marks]

b. If $z_1 = 1 + i$ and $z_2 = 3 + 2i$ find

i) $\frac{z_1}{z_2}$ [3 marks]

ii) $\frac{z_2}{\bar{z}_2}$ [3 marks]

Question 8

a. Find $\frac{dy}{dx}$ for $x^2 + y^2 - 3y = 7$. [3 marks]

b. Hence, determine the tangent and normal equation at point (3, 2) [4 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Matematik Kejuruteraan 1
(Engineering Mathematics 1)

KNF 1013

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 9 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.30 pm – 5.30 pm
Tempat <i>(Place)</i>	: Dewan Kuliah, CTF 1	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Mohammad Shahril Osman		

- Arahan**
(Instruction)
1. **Jawab semua soalan di Bahagian A. Pilih 4 soalan sahaja di Bahagian B.**
*(Answer all questions in Section A).
(Choose 4 questions in Section B)*
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Section A

Answer all questions

Question 1

Express $\frac{13x+16}{(x-3)(3x+2)}$ in partial fractions. [4 marks]

Hence find the value of $\frac{d}{dx} \left[\frac{13x+16}{(x-3)(3x+2)} \right]$ when $x = 2$. [3 marks]

Question 2

The first term of an arithmetic progression is -13 and the last term is 99 . The sum of the progression is 1419 . Find the number of terms and the common difference. [2 marks]

Find also the sum of all the positive terms of the progression. [2 marks]

Question 3

Find the modulus and argument of each of the following complex numbers

a) $6 - 2\sqrt{3}i$ [4 marks]

b) $\sqrt{3}i$ [4 marks]

Question 4

Given a function having the following range $0 \leq y \leq x(4-x)$. Sketch the graph and hence calculate the volume generated between $0 \leq x \leq 4$. [8 marks]

Question 5

Given that $(1 + \sin^2 x) \frac{dy}{dx} = e^{-2y} \sin 2x$ and $y = 1$ when $x = 0$, find the value of y

when $x = \frac{\pi}{2}$.

[8 marks]

Question 6

Let z be the complex number $-1 + \sqrt{3}i$

a) Express z^2 in the form $a + bi$ [4 marks]

b) Find the value of the real number p such that $z^2 + pz$ is real. [2 marks]

c) Find the value of the real number q such that $\text{Arg}(z^2 + qz) = \frac{5\pi}{6}$. [2 marks]

Question 7

Starting from the formulae $\sin(A + B)$ and $\cos(A + B)$, prove that

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

[2 marks]

Find, to 2 decimal places, the positive value of x which satisfies the equation

$$\tan^{-1} x + \tan^{-1} 2x = \frac{\pi}{4}$$

[4 marks]

Question 8

Calculate the radius of curvature of the function $y = x^3$ when $x = 1$.

The radius of curvature is given as: $R = \frac{\{1 + (\frac{dy}{dx})^2\}^{3/2}}{\frac{d^2y}{dx^2}}$ [3 marks]

Question 9

Obtain the limits using L'Hôpital's rule for the following

a) $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$ [2 marks]

b) $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x + x^2}$ [2 marks]

Question 10

Determine the equation of normal to the equation $y = 3x^2 - 2x + 11$ at point (1, 12).

[4 marks]

- End of Section A -

Section B

Answer 4 questions

Question 1

- a) The first three terms of a geometric progression are $2x$, $x-8$, $2x+5$ respectively. Find the possible values of x .
- b) In an another geometric series given by

$$e^{3x} + 3e^x + 9e^{-x} + \dots$$

- i) Find the value of the sum to infinity in the case when $x = \ln 2$.
- ii) Determine the range of values of x for which a sum to infinity exists.

[10 marks]

Question 2

Use the Newton-Raphson method to find the root of

$$e^x - x^2 + 3x - 2 = 0$$

in the interval $0 \leq x \leq 1$. Start with $x = 0.5$ and give the root correct to 4 d.p

[10 marks]

Question 3

Sketch the graph of $y = \sin x$. Hence find the volume rotated around 0 to π . State your answer in terms of π .

[10 marks]

Question 4

Evaluate A, where $A = \int_{0.1}^{0.5} e^{-x} dx$. Estimate the percentage error, correct to one decimal

places, in evaluating A using the trapezoidal rule, with 5 equally spaced ordinates

[10 marks]

Question 5

Illustrate the complex number $w_1 = 3 - i$ and $w_2 = 4 + 2i$ on an Argand diagram.

Calculate the modulus of w_1 and w_2 . Calculate the argument of w_1 and w_2 in the interval $-\pi$ to π , giving your answer to three decimal places.

Given that w_1 and w_2 are the roots of the equation

$$z^2 + pz + q = 0$$

find the complex numbers p and q and show that $q = -2p$

[10 marks]

End of Section



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Matematik Kejuruteraan III
(Engineering Mathematics III)

KNF 2033

Peperiksaan : Akhir
(Examination)

Tarikh : 16 November 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 9.00 am – 12.00 pm
(Time)

Tempat : Dewan Kuliah I
(Place)

Jangkamasa : 3 jam
(Duration)

Pensyarah : En. Jethro Henry Adam
(Lecturer) En. Ghazali Tambi

Arahan : 1. **Jawab 5 daripada 7 soalan.**
(Instruction) *(Answer any 5 of 7 questions).*

2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).

3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).

4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).

5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

- a. Using Gauss-Jordan elimination, find the inverse, A^{-1} of [6 marks]

$$\begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$$

- b. Solve the system using Cramer's rule. [8 marks]

$$-x + 3y - 2z = 7$$

$$3x + 3z = -3$$

$$2x + y + 2z = -1$$

- c. Let $A = \begin{bmatrix} a & b \\ -b & a \end{bmatrix}$ and $B = \begin{bmatrix} c & d \\ -d & c \end{bmatrix}$. [6 marks]

Compute $\det AB = \det A \det B$ to prove that

$$(a^2 + b^2)(c^2 + d^2) = (ac - bd)^2 + (ad + bc)^2.$$

Question 2

An elastic membrane in the x_1x_2 -plane with boundary circle $x_1^2 + x_2^2 = 1$ is stretched so that at point $P : (x_1, x_2)$ goes over into the point $Q : (y_1, y_2)$

given by $\mathbf{y} = \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = A\mathbf{x} = \begin{bmatrix} 2 & 5 \\ 10 & 7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

- a. Find the principal directions of the position vector \mathbf{x} of P for which the direction of the position vector \mathbf{y} of Q is the same or exactly opposite. [8 marks]
- b. What shape does the boundary circle take under this deformation? (factors of deformation and draw the shape before and after it has been stretched). [12 marks]

Question 3

- a. Evaluate $\iint_R (x+2y)^{-1/2} dA$ over the region $x - 2y \leq 1$ & $x \geq y^2 + 1$. Sketch [10 marks]
the region of the integration and show the details of your calculation.
- b. Sketch the region R in the xy-plane bounded by $y = x^2$, $x = 2$, $y = 1$. [10 marks]
Evaluate the double integral $\iint_R (x^2 + y^2) dy dx$.

Question 4

For matrix $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & 0 & 1 \\ 2 & 0 & 0 \end{bmatrix}$,

- a. Find the eigenvalues of the matrix [8 marks]
- b. Corresponding to each eigenvalue, find an eigenvector [8 marks]
- c. Sketch the Gerschgorin circles and approximately locate the eigenvalues as point in the plane [6 marks]

Question 5

- a. Produce a matrix that diagonalizes the given matrix or show that this matrix is not diagonalizable.

$$A = \begin{bmatrix} -5 & 3 \\ 0 & 9 \end{bmatrix}$$

[10 marks]

- b. Find the standard form of the quadratic form.

$$-5x_1^2 + 4x_1x_2 + 3x_2^2$$

[10 marks]

Question 6

Compute the directional derivative of the function in the direction of the given vector.

a. $\phi(x,y,z) = 8xy^2 - xz; (1/\sqrt{3})(i + j + k)$

[10 marks]

b. $\phi(x,y,z) = \sin(x - y + 2z); -i + j + k$

[10 marks]

Question 7

a. Evaluate the determinant of the matrix $A = \begin{bmatrix} 2 & 7 & -1 & 0 \\ 3 & 1 & 1 & 8 \\ -2 & 0 & 3 & 1 \\ 4 & 8 & -1 & 0 \end{bmatrix}$

[10 marks]

b. Evaluate the determinant of matrix $B = \begin{bmatrix} -5 & 6 & 1 & -1 & 0 \\ 1 & 3 & -1 & -1 & 3 \\ 4 & 2 & -2 & 1 & 1 \\ 0 & 0 & 3 & 1 & -2 \\ 1 & 0 & 0 & -2 & -2 \\ 0 & 0 & 1 & 1 & -1 \end{bmatrix}$

[10 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kaedah Numerikal dan Statistik
(Numerical methods and Statistics)

KNF 2053

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 14 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm - 5.00pm
Tempat <i>(Place)</i>	: Makmal Elektronik	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Cik Kho Lee Chin En. Ngu Sze Song		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

The following equations describe an electrical circuit.

$$\begin{aligned} 30i_1 - 20i_2 - 10i_3 &= 0 \\ -20i_1 + 55i_2 - 10i_3 &= 0 \\ -10i_1 - 10i_2 + 50i_3 &= 200 \end{aligned}$$

- Find the Upper triangular matrix by using Gaussian elimination. [6 marks]
- Use LU factorisation method to find the value of i_1, i_2 and i_3 . [7 marks]

Question 2

Find a root of the equation below on the interval $[1, 2]$ by using Newton-Raphson method with the initial values as 1.5.

$$x^3 + 4x^2 = 10$$

Take the termination criterion as $|x_n - x_{n-1}| < \varepsilon$, where $\varepsilon = 1 \times 10^{-8}$. [15 marks]

Question 3

- Given the data

x	1	2	3	5
f(x)	4.75	4	5.25	19.75

Calculate $f(4)$ using Lagrange Polynomial of order 1 and 2 [10 marks]

- Consider the differential equation

$$y' = y - x^2 + 1, \quad 0 \leq x \leq 2, \quad y(0) = 0.5$$

Obtain an approximations solution by Runge-Kutta method of Order Four with

$h = 0.4$. The exact solution is $y(x) = (x+1)^2 - \frac{e^x}{2}$. [12 marks]

Question 4

- a. A paint-store chain produces and sells latex and semigloss paint. Based on long-range sales, the probability that a customer will purchase latex is 0.75. Of those that purchase latex paint, 60% also purchase rollers. But 30% of semigloss paint buyers purchase rollers. A randomly selected buyer purchases a roller and a can of paint. What is the probability that the paint is latex paint? [6 marks]
- b. Johnson Electronic makes calculators. Consumer satisfaction is one of the company's management. The company guarantees a refund or a replacement for any calculator that malfunctions within 2 years from the date of purchase. It is known from past data that despite all efforts, 5% of the calculators manufactured by the company malfunction within a two-year period. The company mailed a package of 10 randomly selected calculators to a store.
- i) Let x denote the number of calculators in this package of 10 that will be returned for refund or replacement within a 2 years period. Determine the mean and standard deviation of x .
 - ii) Find the probability that exactly 2 of 10 calculators will be returned for refund or replacement within 2 years period. [6 marks]
- c. Let C be a constant and consider the density function
- $$f(y) = \begin{cases} C(2-y), & \text{if } 0 \leq y < 1 \\ 0, & \text{elsewhere.} \end{cases}$$
- Find the value of C and the cumulative distribution function, $F(y)$. [4 marks]

Question 5

- a. The amount of time that a drive- through bank teller spends on a customer is a random variable with a mean $\mu=3.2$ minutes and $\sigma=1.6$ minutes. If a random sample of 64 customers is observed, find the probability that their mean time at teller's counter is
- i) at most 2.7 minutes.
 - ii) more than 3.5 minutes. [8 marks]
- b. A sample of 10 observations taken from a normally distributed population produced the following data.
- 44, 52, 31, 48, 46, 39, 43, 36, 41, 49
- i) What is the point estimate of μ ?
 - ii) Construct a 95% confidence interval for μ . [5 marks]
- c. Assume that the weight of cereal in "15-ounce box" is $N(\mu, \sigma^2)$. To test $H_0 : \mu = 10.1$ against $H_1 : \mu > 10.1$, we take a random sample of size $n = 16$ and observe that $\bar{X} = 10.4$ and $s = 0.4$.
- i) Do we accept H_0 at the 5% significance level?
 - ii) What is the approximate p -value of the test? [5 marks]

Question 6

- a. Susan Sound predicts that students will learn most effectively with a constant background sound, as opposed to an unpredictable sound or no sound at all. She randomly divides twenty-four students into three groups of eight. All students study a passage of text for 30 minutes. Those in group 1 study with background sound at a constant volume in the background. Those in group 2 study with noise that changes volume periodically. Those in group 3 study with no sound at all. After studying, all students take a 10 point multiple choice test over the material. Their scores follow:

Group	Test Scores							
Constant Sound	7	4	6	8	6	6	2	9
Random Sound	5	5	3	4	4	7	2	2
No Sound	2	4	7	1	2	1	5	5

[8 marks]

Calculate the error sum of squares, SSE

- b.

X	1	2.3	3.1	4.8	5.6	6.3
Y	2.6	2.8	3.1	4.7	5.1	5.3

Refer to the table shown above, develop a simple linear regression model, and determine the value of calculated estimates of the slope and intercept of the regression line. Find also the correlation coefficient, r .

[8 marks]

Appendix: Z-distribution Table

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-4.0	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00002	0.00002	0.00002	0.00002
-3.9	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00003	0.00003
-3.8	0.00007	0.00007	0.00007	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005	0.00005
-3.7	0.00011	0.00010	0.00010	0.00010	0.00009	0.00009	0.00008	0.00008	0.00008	0.00008
-3.6	0.00016	0.00015	0.00015	0.00014	0.00014	0.00013	0.00013	0.00012	0.00012	0.00011
-3.5	0.00023	0.00022	0.00022	0.00021	0.00020	0.00019	0.00019	0.00018	0.00017	0.00017
-3.4	0.00034	0.00032	0.00031	0.00030	0.00029	0.00028	0.00027	0.00026	0.00025	0.00024
-3.3	0.00048	0.00047	0.00045	0.00043	0.00042	0.00040	0.00039	0.00038	0.00036	0.00035
-3.2	0.00069	0.00066	0.00064	0.00062	0.00060	0.00058	0.00056	0.00054	0.00052	0.00050
-3.1	0.00097	0.00094	0.00090	0.00087	0.00084	0.00082	0.00079	0.00076	0.00074	0.00071
-3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00103	0.00100
-2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139
-2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193
-2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264
-2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357
-2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480
-2.4	0.00820	0.00798	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639
-2.3	0.01072	0.01044	0.01017	0.00990	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842
-2.2	0.01390	0.01355	0.01321	0.01287	0.01255	0.01222	0.01191	0.01160	0.01130	0.01101
-2.1	0.01786	0.01743	0.01700	0.01659	0.01618	0.01578	0.01539	0.01500	0.01463	0.01426
-2.0	0.02275	0.02222	0.02169	0.02118	0.02067	0.02018	0.01970	0.01923	0.01876	0.01831
-1.9	0.02872	0.02807	0.02743	0.02680	0.02619	0.02559	0.02500	0.02442	0.02385	0.02330
-1.8	0.03593	0.03515	0.03438	0.03362	0.03288	0.03216	0.03144	0.03074	0.03005	0.02938
-1.7	0.04456	0.04363	0.04272	0.04181	0.04093	0.04006	0.03920	0.03836	0.03754	0.03673
-1.6	0.05480	0.05370	0.05262	0.05155	0.05050	0.04947	0.04846	0.04746	0.04648	0.04551
-1.5	0.06681	0.06552	0.06425	0.06301	0.06178	0.06057	0.05938	0.05821	0.05705	0.05592
-1.4	0.08076	0.07927	0.07780	0.07636	0.07493	0.07353	0.07214	0.07078	0.06944	0.06811
-1.3	0.09680	0.09510	0.09342	0.09176	0.09012	0.08851	0.08691	0.08534	0.08379	0.08226
-1.2	0.11507	0.11314	0.11123	0.10935	0.10749	0.10565	0.10383	0.10204	0.10027	0.09852
-1.1	0.13566	0.13350	0.13136	0.12924	0.12714	0.12507	0.12302	0.12100	0.11900	0.11702
-1.0	0.15865	0.15625	0.15386	0.15150	0.14917	0.14686	0.14457	0.14231	0.14007	0.13786
-0.9	0.18406	0.18141	0.17878	0.17618	0.17361	0.17105	0.16853	0.16602	0.16354	0.16109
-0.8	0.21185	0.20897	0.20611	0.20327	0.20045	0.19766	0.19489	0.19215	0.18943	0.18673
-0.7	0.24196	0.23885	0.23576	0.23269	0.22965	0.22663	0.22363	0.22065	0.21769	0.21476
-0.6	0.27425	0.27093	0.26763	0.26434	0.26108	0.25784	0.25462	0.25143	0.24825	0.24509
-0.5	0.30853	0.30502	0.30153	0.29805	0.29460	0.29116	0.28774	0.28434	0.28095	0.27759
-0.4	0.34457	0.34090	0.33724	0.33359	0.32997	0.32635	0.32276	0.31917	0.31561	0.31206
-0.3	0.38209	0.37828	0.37448	0.37070	0.36692	0.36317	0.35942	0.35569	0.35197	0.34826
-0.2	0.42074	0.41683	0.41293	0.40904	0.40516	0.40129	0.39743	0.39358	0.38974	0.38590
-0.1	0.46017	0.45620	0.45224	0.44828	0.44433	0.44038	0.43644	0.43250	0.42857	0.42465
-0.0	0.50000	0.49601	0.49202	0.48803	0.48404	0.48006	0.47607	0.47209	0.46811	0.46414

Appendix:**PERCENTAGE POINTS OF THE T DISTRIBUTION****Tail Probabilities**

One Tail	0.10	0.05	0.025	0.01	0.005	0.001	0.0005	
Two Tails	0.20	0.10	0.05	0.02	0.01	0.002	0.001	
D 1	3.078	6.314	12.71	31.82	63.66	318.3	637	1
E 2	1.886	2.920	4.303	6.965	9.925	22.330	31.6	2
G 3	1.638	2.353	3.182	4.541	5.841	10.210	12.92	3
R 4	1.533	2.132	2.776	3.747	4.604	7.173	8.610	4
E 5	1.476	2.015	2.571	3.365	4.032	5.893	6.869	5
E 6	1.440	1.943	2.447	3.143	3.707	5.208	5.959	6
S 7	1.415	1.895	2.365	2.998	3.499	4.785	5.408	7
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041	8
O 9	1.383	1.833	2.262	2.821	3.250	4.297	4.781	9
F 10	1.372	1.812	2.228	2.764	3.169	4.144	4.587	10
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437	11
F 12	1.356	1.782	2.179	2.681	3.055	3.930	4.318	12
R 13	1.350	1.771	2.160	2.650	3.012	3.852	4.221	13
E 14	1.345	1.761	2.145	2.624	2.977	3.787	4.140	14
E 15	1.341	1.753	2.131	2.602	2.947	3.733	4.073	15
D 16	1.337	1.746	2.120	2.583	2.921	3.686	4.015	16
O 17	1.333	1.740	2.110	2.567	2.898	3.646	3.965	17
M 18	1.330	1.734	2.101	2.552	2.878	3.610	3.922	18
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883	19
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850	20
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819	21
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792	22
23	1.319	1.714	2.069	2.500	2.807	3.485	3.768	23
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745	24
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725	25
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707	26
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690	27
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674	28
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659	29
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646	30
32	1.309	1.694	2.037	2.449	2.738	3.365	3.622	32
34	1.307	1.691	2.032	2.441	2.728	3.348	3.601	34
36	1.306	1.688	2.028	2.434	2.719	3.333	3.582	36
38	1.304	1.686	2.024	2.429	2.712	3.319	3.566	38
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551	40
42	1.302	1.682	2.018	2.418	2.698	3.296	3.538	42
44	1.301	1.680	2.015	2.414	2.692	3.286	3.526	44
46	1.300	1.679	2.013	2.410	2.687	3.277	3.515	46
48	1.299	1.677	2.011	2.407	2.682	3.269	3.505	48
50	1.299	1.676	2.009	2.403	2.678	3.261	3.496	50
55	1.297	1.673	2.004	2.396	2.668	3.245	3.476	55
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460	60
65	1.295	1.669	1.997	2.385	2.654	3.220	3.447	65
70	1.294	1.667	1.994	2.381	2.648	3.211	3.435	70
80	1.292	1.664	1.990	2.374	2.639	3.195	3.416	80
100	1.290	1.660	1.984	2.364	2.626	3.174	3.390	100
150	1.287	1.655	1.976	2.351	2.609	3.145	3.357	150
200	1.286	1.653	1.972	2.345	2.601	3.131	3.340	200

Two Tails	0.20	0.10	0.05	0.02	0.01	0.002	0.001
One Tail	0.10	0.05	0.025	0.01	0.005	0.001	0.0005

Tail Probabilities



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Pemrograman Kejuruteraan
(Engineering Programming)

KNF1082

Peperiksaan : Akhir
(Examination)

Tarikh : 8 November 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 9.00 am – 11.00 am
(Time)

Tempat : DK 1
(Place)

Jangkamasa : 2 jam
(Duration)

Pensyarah : Dr. Andrew R.H. Rigit
(Lecturer)

- Arahan** :
(Instruction)
1. **Jawab semua empat soalan.**
(Answer all four (4) questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam kertas jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer sheets provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Question 1

- a. Write the MATLAB syntax for these commonly used mathematical functions:

- i. e^x
- ii. $(x)^{1/2}$
- iii. $\ln x$
- iv. $\cos x$
- v. $\cos^{-1} x$

(10 marks)

- b. Draw a flowchart to calculate the amount of tax a person must pay under a new tax law for any amount of taxable income (Input INCOME) if the tax tables are as follows:

Up to RM 15,000	No tax
RM 15,000 to RM 25,000	10%
RM 25,000 to RM 50,000	20%
Over RM 50,000	30%

(15 marks)

Question 2

- a. Write a MATLAB program to solve the set of the following linear algebraic equations:

$$6x + 12y + 4z = 70$$

$$7x - 2y + 3z = 5$$

$$2x + 8y - 9z = 64$$

(10 marks)

- b. The speed v of a falling object dropped with no initial velocity is given as a function of time t by $v = gt$, where g is the acceleration due to gravity. In SI units, $g = 9.81 \text{ m/s}^2$. We want to compute and plot v as a function of t for $0 \leq t \leq t_f$, where t_f is the final time entered by the user.

Please write a simple MATLAB script file for the calculation and plotting of v in m/s versus t in seconds. Choose a 500-spacing in order to obtain 501 points. Where possible, describe your program within the script.

(15 marks)

Question 3

- a. Write a MATLAB script file to compute y from $y = (x)^{1/2}$ for $x \geq 9$, $y = 1 + (x)^{1/2}$ for $0 \leq x < 9$, and $y = -(x)^{1/2}$ for $x < 0$.

(10 marks)

- b. Write a MATLAB script file to plot the function y from $y = (x)^{1/2}$ for $x \geq 9$, $y = 1 + (x)^{1/2}$ for $0 \leq x < 9$, and $y = -(x)^{1/2}$ for $x < 0$, for $-5 \leq x \leq 30$. Choose a 300-spacing in order to obtain 301 points.

(15 marks)

Question 4

- a. Please identify the codes/specifiers for the following data markers, line types and colours:

(I) Data markers:

- (i) Circle
- (ii) Diamond

(II) Line types:

- (i) Dashed line
- (ii) Dotted line

(III) Colours:

- (i) Black

(10 marks)

- b. Please write a MATLAB script file for plotting the following functions in the same figure by using the *subplot* command:

$$y = e^{-1.2x} \sin(10x+5) \text{ for } 0 \leq x \leq 5 \text{ and } y = |x^3 - 100| \text{ for } -6 \leq x \leq 6.$$

(15 marks)

**KURSUS
KEJURUTERAAN
SIVIL
(KNS)**

**FAKULTI
KEJURUTERAAN**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Rekabentuk Struktur Keluli
(Structural Steel Design)

KNS 4214

Peperiksaan : Akhir
(Examination)

Tarikh : 7 November 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 9.00 am -12.00 pm
(Time)

Tempat : Bilik Seminar 23
(Place)

Jangkamasa : 3 jam
(Duration)

Pensyarah : Pn. Azida Rashidi
(Lecturer)

- Arahan** :
(Instruction)
1. Bahagian A adalah wajib dan jawab semua soalan. Kemudian, pilih dan jawab samada Bahagian B atau C.
(Section A is compulsory and answer ALL questions., Then choose and answer either Section B or C).
 2. Baca soalan dengan teliti sebelum menjawab.
(Read the questions carefully before answering).
 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.
(Write the answers only in the answer books provided using only pen).
 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.
(No talking or disturbing other candidates during the duration of test).
 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

SECTION A**QUESTION 1 (30 marks)**

A steel beam of 10.0 m span carries the loading as shown in Figure 1. Lateral restraint is provided at the supports and between A and B (due to insitu concrete slab). All the loadings and moments are **ULTIMATE** loadings and moments.

Draw the bending moment and shear force diagrams for the beam

[6 marks]

Using Grade 43 steel, select a suitable universal beam section to satisfy:

a) co-existent shear requirement

[6marks]

b) bending requirement

[18 marks]

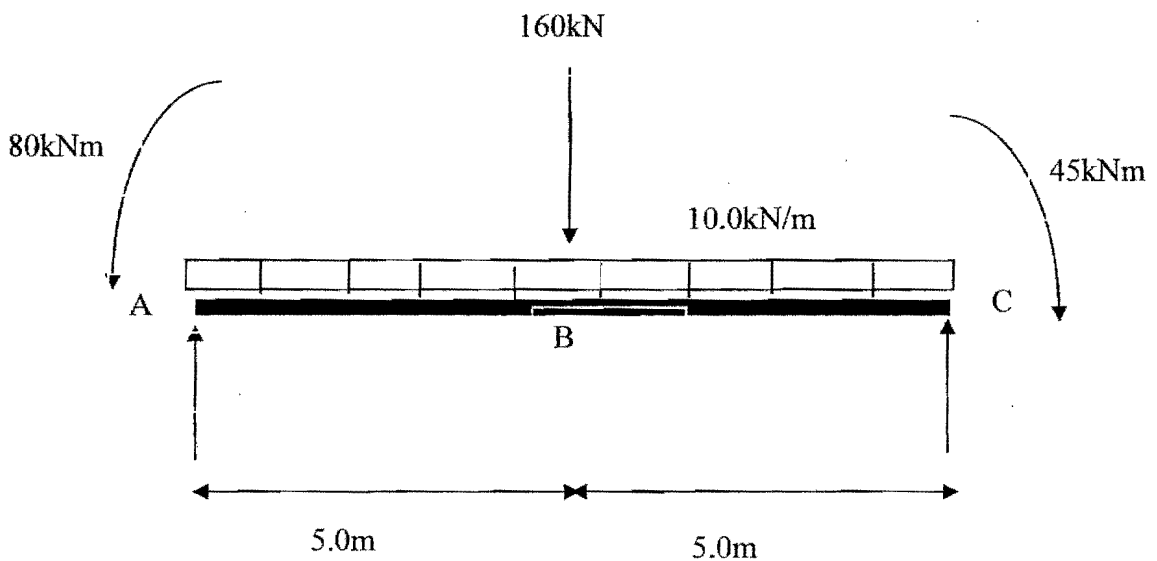


FIGURE 1

QUESTION TWO (40 marks)

The plan of the floor and roof for an office building and its cross-section are shown in Figures 2a and 2b. Column A is a steel 203 x 203 x 46 kg/m UC with uniform sectional properties throughout. The self-weight of the column is assumed to be 2 kN/floor. The design for the steel column is based on 'simple' design. Based on this design, you are required to:

- Find the total axial load at the first floor on the column B **[6 marks]**
- Find the reaction from beam F2 on to the column A at First floor **[4 marks]**
(Refer to: Figure 2(b):Cross-section Z-Z and Figure 2(c):Loads to Column A/B)
- Find the nominal moment and axial load on column A for checking purposes in (d).
(Note: Column A and B has same axial load from Roof to Second floor) **[10 marks]**
- Check that the capacity of the column, A, has adequate capacity as a compression member **[20 marks]**

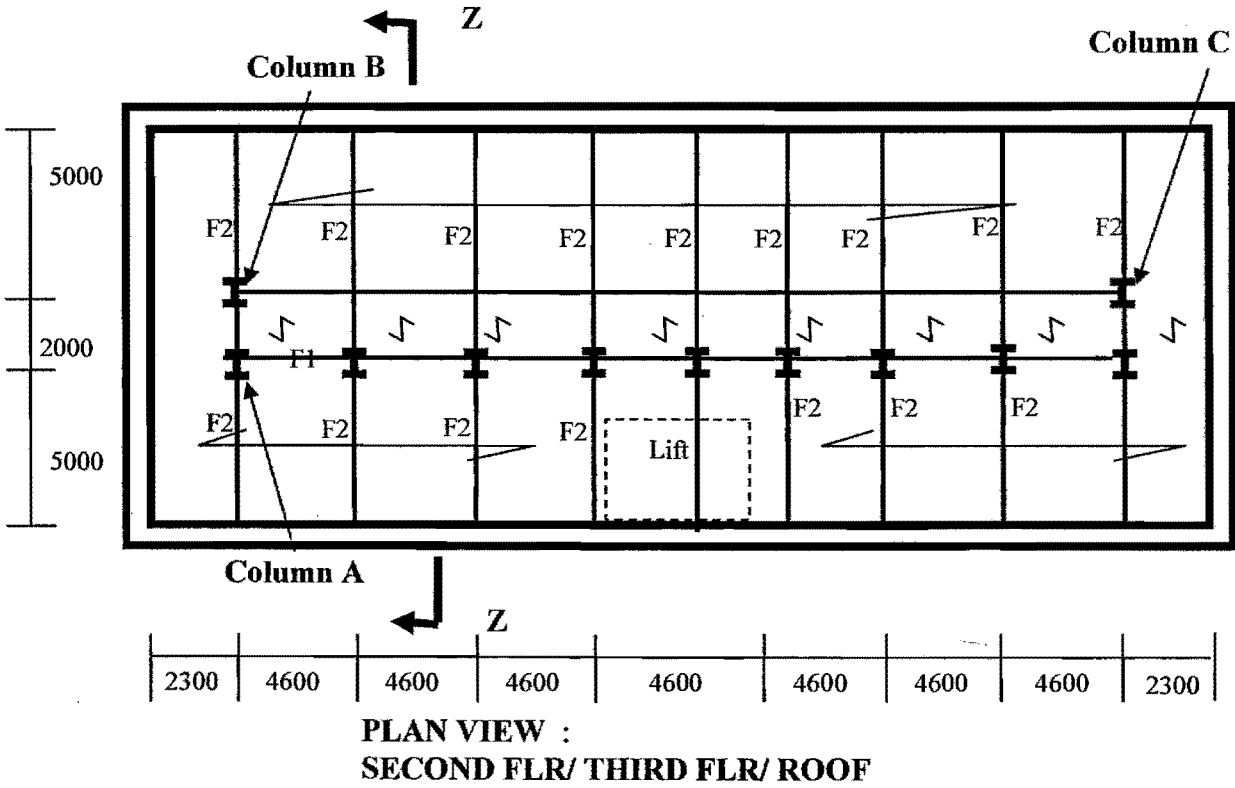
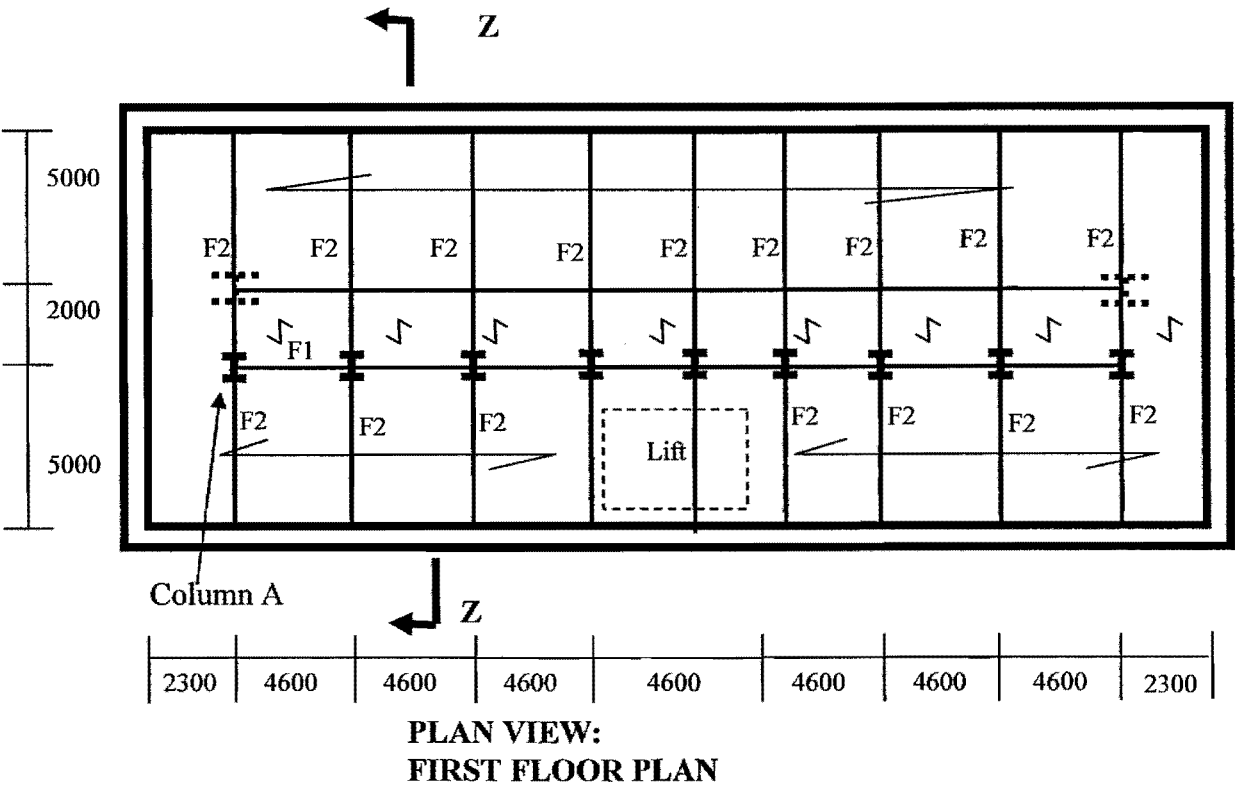
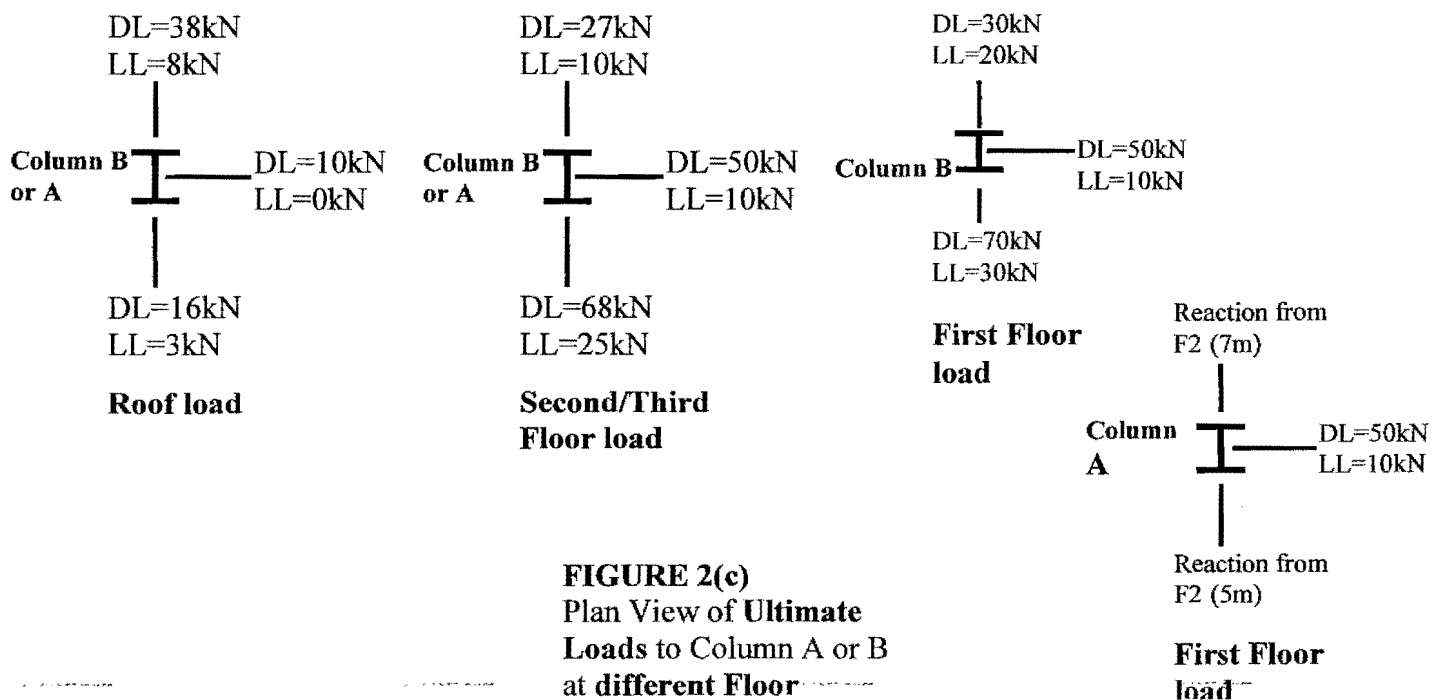
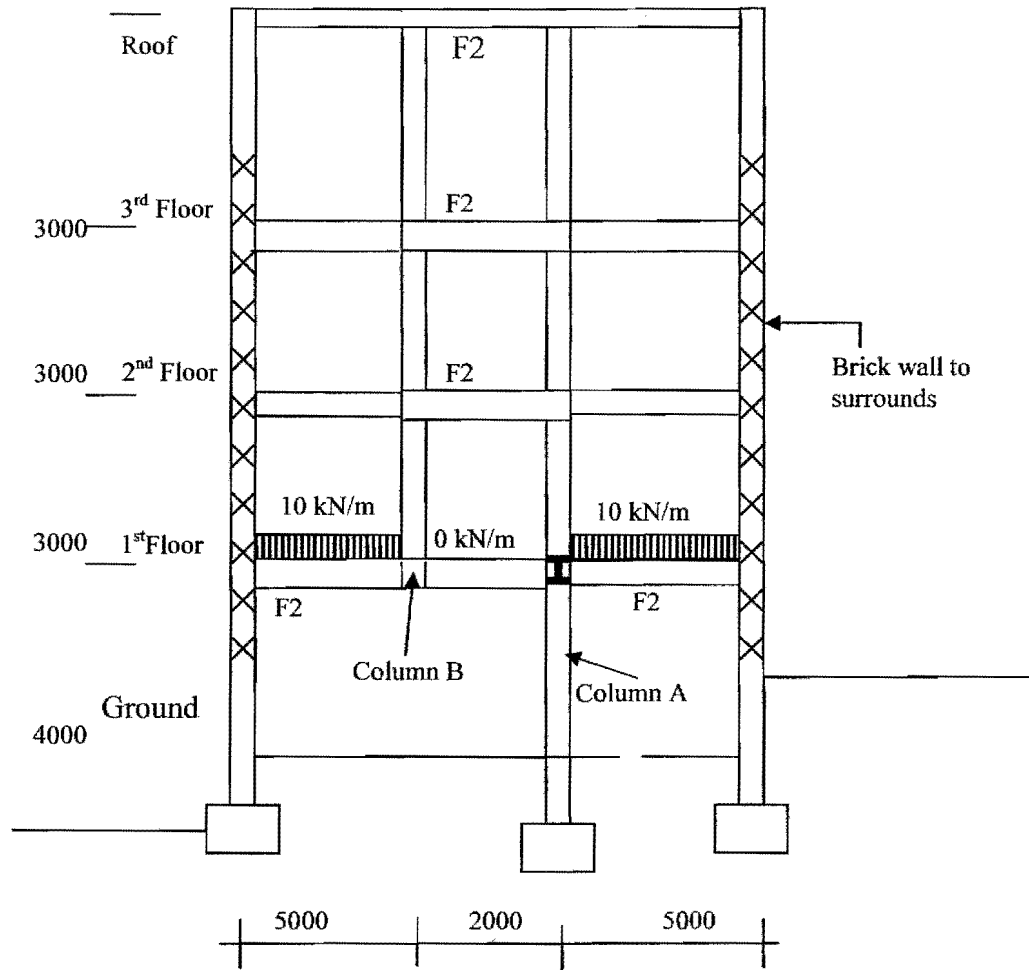


Figure 2(a)



SECTION B**QUESTION 3 (30 marks)**

A roof truss is shown in Figure 3. The trusses are at 6.0 m centers, the length of the building is 36m and the height to the eaves is 5 m. The roof loadings are

Dead load = 0.40 kN/m^2 (on slope)

Imposed load = 0.75 kN/m^2 (on plan)

The wind load is to be estimated using CP3: Chapter V: Part 2. The building is located on the outskirts of a city and the basic wind speed is 45 m/s. Given that C_{pi} , internal pressure coefficient, is taken as +0.2 and -0.3. Ground Roughness Category = 3, Cladding and Building Size = Class B. Determine the:

- external pressure coefficient, C_{pe} , values for the roof. Hence the resultant C_p 's for the roof surfaces [6marks]
- external pressure coefficient, C_{pe} values for wall faces, C and D. Hence the resultant C_p 's for the wall surfaces [6marks]
- V_s (designed wind speed) and ' q ' (dynamic pressure). Hence, find the designed wind loading (in kN) on the roof face [6marks]
- Dead and Imposed load for the truss for primary analysis for internal and end panels [5marks]
- Assuming the lower chord, A, carries a ultimate tension force of 100 kN, determine a single angle L size to take the tension force. The longer leg of the angle, L, is welded to the gusset plate (Point to consider: First determine the approximate cross-sectional area) [7marks]

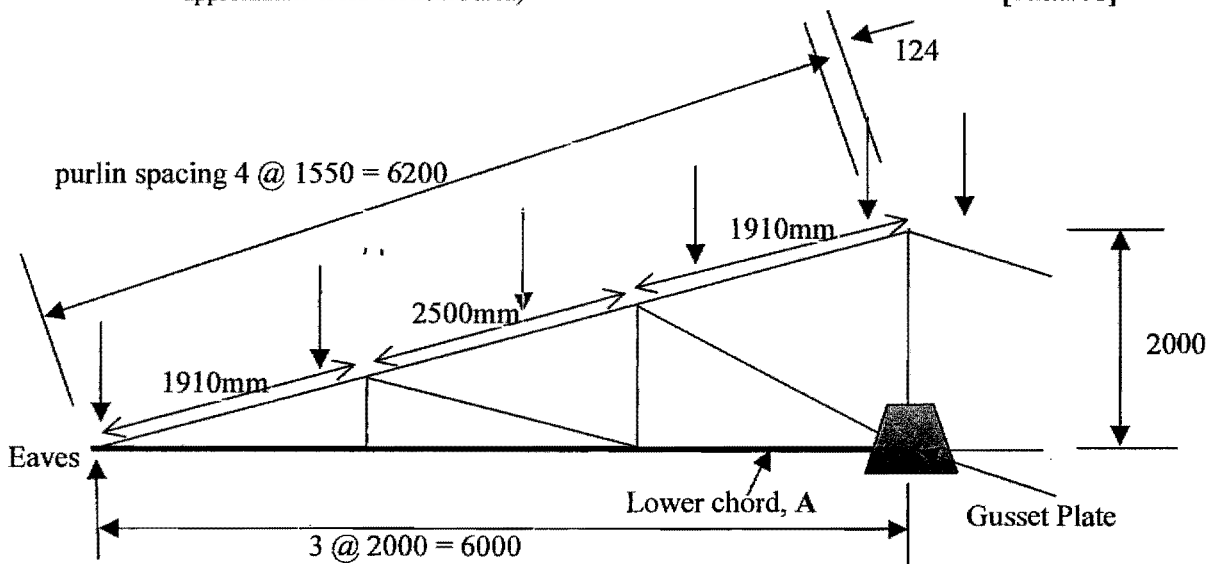


FIGURE 3a:
(Roof Cross-section where dimensions in mm)

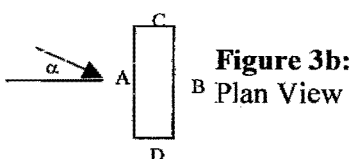


Figure 3b:
B Plan View

SECTION C

(This section consists of Questions 4, 5 and 6]

QUESTION 4. [10 marks]

(*Ultimate load* to **Column C** of Question 2 is shown in Figure 4 below).

Find the total axial load until the first floor. Hence, check that the capacity of the column, B, a 203 x 203 x 46UC, is adequate as a TENSION member using the moment x-x axis and moment y-y axis calculated in Question 2.

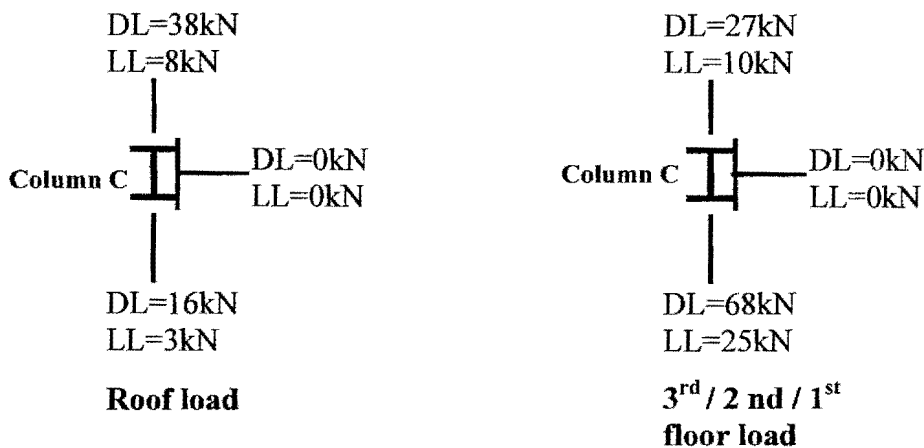


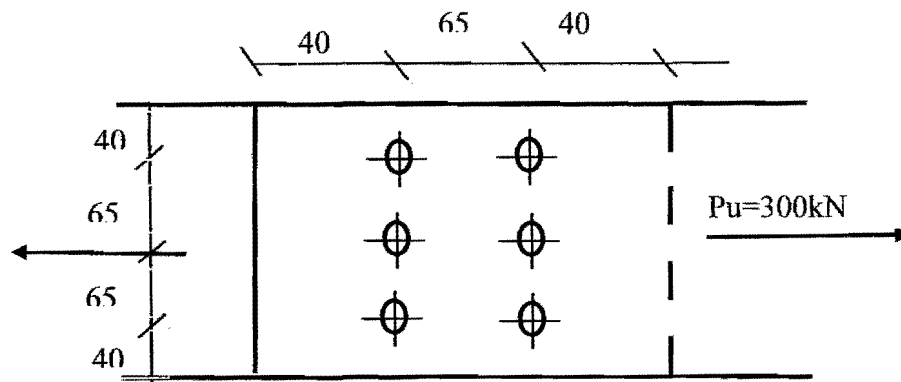
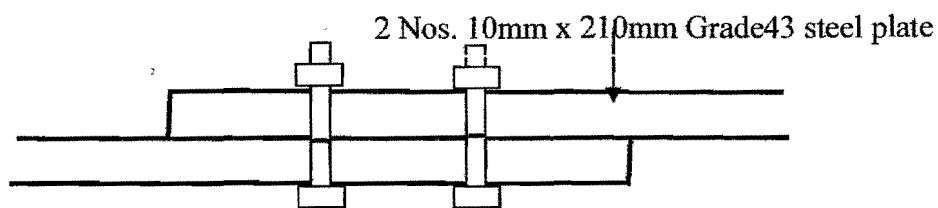
Figure 4:
Plan View of **Ultimate**
Loads to Column C
at **different Floor**

QUESTION 5 [10 marks]

A 203 X 203 X 46UC stanchion carries an axial, 1000 kN ultimate load. Adopting a square base slab for its column base, determine the size and thickness required. The cube strength of the concrete grout is 35 N/mm². State any assumptions made.

QUESTION 6 [10 marks]

A single-shear bolted lap joint in Figure 4 is subjected to an ultimate tensile load of 300kN. Determine a suitable ordinary bolt diameter using Grade 4.6 that will pass the shear, bearing and tensile check.

**Figure 6(a): Plan****Figure 6(b) : Cross Section**

GANBATTE KUDASAI
Good Luck



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

MEKANIK TANAH
(Soil Mechanics)

KNS 2123

Peperiksaan : Peperiksaan Akhir
(Examination) **Tarikh** : 7th November 2005
(Date)

Semester : I Sesi 2005/2006
Masa : 2.00 – 5.00 pm
(Time)

Tempat : Bilik seminar 23
(Place) **Jangkamasa** : 3 Jam
(Duration)

Pensyarah : Pn Norazzlina M. Sa'Don & Dr. Prabir Kumar Kolay
(Lecturer)

- Arahan** : 1. **Semuanya ada ENAM soalan. Jawab hanya EMPAT soalan**
(Instruction) *(There are SIX questions. Answer any FOUR)*
2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
3. **Tulis jawapan hanya di dalam kertas jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer sheets provided using only pen)
4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

There are **SIX (6)** questions. Answer **FOUR (4)** questions. Two each from SECTION A and SECTION B. (Assume reasonable value(s) of any data, if missing. Answer should be brief and to the point. The figures in the margin indicate full marks)

SECTION A [Answer two (2) questions from Section A]

Question 1

- (a) Following are the results of sieve analysis:

Opening (mm)	Mass of soil retained on each sieve (g)
4.75	0
2.00	41.2
0.850	55.1
0.425	80.0
0.250	91.6
0.150	60.5
0.075	35.6
pan	21.5

- (i) Determine the percent finer than each sieve size and plot a grain-size distribution curve.
(ii) Calculate the uniformity coefficient, C_u
(iii) Calculate the uniformity curvature, C_z [10 marks]

- (b) Classify the following soils using the Unified classification system:

Soil	Sieve analysis, % finer		Liquid limit	Plasticity index
	No. 4	No. 200		
A	80	52	30	8
B	79	45	26	4
C	91	80	60	32
D	95	75	41	12
E	82	41	24	2

Give the group symbols and the group names.

[15 marks]

Question 2

- (a) For a given soil, show that

$$e = \frac{\gamma_{sat} - \gamma_d}{\gamma_d - \gamma_{sat} + \gamma_w}$$

[5 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

MEKANIK TANAH
(Soil Mechanics)

KNS 2123

Peperiksaan : Peperiksaan Akhir
(Examination) **Tarikh** : 7th November 2005
(Date)

Semester : I Sesi 2005/2006
Masa : 2.00 – 5.00 pm
(Time)

Tempat : Bilik seminar 23
(Place) **Jangkamasa** : 3 Jam
(Duration)

Pensyarah : Pn Norazzlina M. Sa'Don & Dr. Prabir Kumar Kolay
(Lecturer)

- Arahan** : 1. **Semuanya ada ENAM soalan. Jawab hanya EMPAT soalan**
(Instruction) *(There are SIX questions. Answer any FOUR)*
2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
3. **Tulis jawapan hanya di dalam kertas jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer sheets provided using only pen)
4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

There are **SIX (6)** questions. Answer **FOUR (4)** questions. Two each from SECTION A and SECTION B. (Assume reasonable value(s) of any data, if missing. Answer should be brief and to the point. The figures in the margin indicate full marks)

SECTION A [Answer two (2) questions from Section A]

Question 1

- (a) Following are the results of sieve analysis:

Opening (mm)	Mass of soil retained on each sieve (g)
4.75	0
2.00	41.2
0.850	55.1
0.425	80.0
0.250	91.6
0.150	60.5
0.075	35.6
pan	21.5

- (i) Determine the percent finer than each sieve size and plot a grain-size distribution curve.
(ii) Calculate the uniformity coefficient, C_u
(iii) Calculate the uniformity curvature, C_z [10 marks]

- (b) Classify the following soils using the Unified classification system:

Soil	Sieve analysis, % finer		Liquid limit	Plasticity index
	No. 4	No. 200		
A	80	52	30	8
B	79	45	26	4
C	91	80	60	32
D	95	75	41	12
E	82	41	24	2

Give the group symbols and the group names.

[15 marks]

Question 2

- (a) For a given soil, show that

$$e = \frac{\gamma_{sat} - \gamma_d}{\gamma_d - \gamma_{sat} + \gamma_w}$$

[5 marks]

- (b) Describe clearly with sketch how you will determine the co-efficient of permeability of a clay sample in the laboratory and derive the expression used to compute the permeability co-efficient. [15 Marks]

Question 5

- (a) In order to compute the seepage loss through the foundation of a dam, flownets were constructed. The result of the flow-net gave number of flow line, $N_f = 6$ and number of equipotential drop, $N_d = 16$. The head loss during seepage was 6 m. If the co-efficient of permeability of the soil, $k = 4 \times 10^{-5}$ m/min., compute the seepage loss per meter length of dam per day. [10 Marks]
- (b) A concentrated load of 30 kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity: (i) at a depth of 8 m directly under the load; and (ii) at a depth of 8 m, horizontally 6 m apart from the load. Use Boussinesq's equation. [15 Marks]

Question 6

- (a) Determine the neutral and effective stress at a depth 16 m below the ground level; for the following conditions shown in Fig. 2. The water table is 3 m below ground level. Given that, $G = 2.68$; $e = 0.72$; and average water content of the soil above water table is 8%.

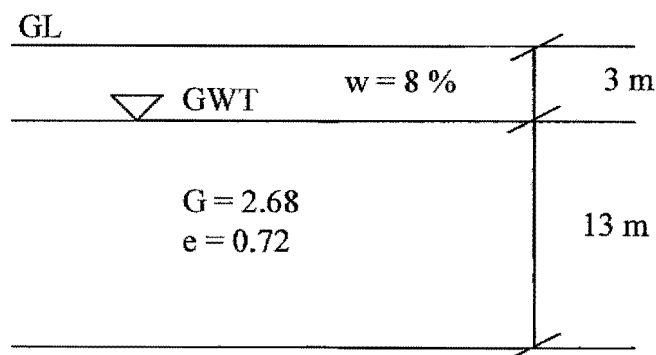


Fig. 2 for question no. 6 (a)

[15 marks]

- (b) A 60 cm diameter well is being pumped at a rate of 1360 liters/minutes. The following measurements in a nearby test well were made at the same time. At a distance of 6 m from the well being pumped, the drawdown was 6 m, and at 15 m the drawdown was 1.5 m. the bottom of the well is 90 m below the ground water table. Compute the co-efficient of permeability.

[10 Marks]

APPENDIX

$$\gamma = \frac{(G_s + Se)\gamma_w}{1 + e}; \gamma = \frac{(1 + w)G}{(1 + e)} \cdot \gamma_w; \sigma_z = \frac{Q}{z^2} \cdot \frac{3}{2\pi} \left[\frac{1}{1 + \left(\frac{r}{z}\right)^2} \right]^{5/2}; \gamma_{sat} = \left(\frac{G + e}{1 + e} \right) \cdot \gamma_w$$

$$Q = \frac{\pi K [h_2^2 - h_1^2]}{2.3 \log_{10} \frac{r_2}{r_1}}; D_r = \frac{e_{\max} - e}{e_{\max} - e_{\min}}; \frac{\Delta H}{H} = \frac{\Delta e}{1 + e_1}; k_z = \frac{z}{\frac{z_1}{k_1} + \frac{z_2}{k_2} + \frac{z_3}{k_3} + \dots}$$

$$k_x = \frac{k_1 z_1 + k_2 z_2 + k_3 z_3 + \dots}{z}; q = k h \frac{N_f}{N_d}; \gamma_d = \frac{G_s \gamma_w}{1 + e}$$

$$z = z_1 + z_2 + z_3 + \dots$$

Table 4.2 Unified Classification System (Based on Materials Passing 75 mm (3 in.) Sieve (Based on ASTM-2487))

Major division		Group symbol	Criteria
$F_{200} < 50$	Gravels	GW	$F_{200} < 5$; $C_u \geq 4$; $1 \leq C_z \leq 3$
		GP	$F_{200} < 5$; Not meeting the GW criteria of C_u and C_z
		GM	$F_{200} > 12$; $PI < 4$ or plots below A-line (Fig. 4.2)
		GC	$F_{200} > 12$; $PI > 7$ and plots on or above A-line (Fig. 4.2)
		GM-GC	$F_{200} > 12$; PI plots in the hatched area (Fig. 4.2)
		GW-GM	$5 \leq F_{200} \leq 12$; satisfies C_u and C_z criteria of GW and meets the PI criteria for GM
		GW-GC	$5 \leq F_{200} \leq 12$; satisfies C_u and C_z criteria of GW and meets the PI criteria for GC
		GP-GM	$5 \leq F_{200} \leq 12$; does not satisfy C_u and C_z criteria of GW and meets the PI criteria for GM
		GP-GC	$5 \leq F_{200} \leq 12$; does not satisfy C_u and C_z criteria of GW and meets the PI criteria for GC
	Sands	SW	$F_{200} < 5$; $C_u \geq 6$; $1 \leq C_z \leq 3$
		SP	$F_{200} < 5$; Not meeting the SW criteria of C_u and C_z
		SM	$F_{200} > 12$; $PI < 4$ or plots below A-line (Fig. 4.2)
		SC	$F_{200} > 12$; $PI > 7$ and plots on or above A-line (Fig. 4.2)
		SM-SC	$F_{200} > 12$; PI plots in the hatched area (Fig. 4.2)
		SW-SM	$5 \leq F_{200} \leq 12$; satisfies C_u and C_z criteria of SW and meets the PI criteria for SM
		SW-SC	$5 \leq F_{200} \leq 12$; satisfies C_u and C_z criteria of SW and meets the PI criteria for SC
		SP-SM	$5 \leq F_{200} \leq 12$; does not satisfy C_u and C_z criteria of SW and meets the PI criteria for SM
		SP-SC	$5 \leq F_{200} \leq 12$; does not satisfy C_u and C_z criteria of SW and meets the PI criteria for SC
$F_{200} \geq 50$	Silts and Clays	ML	$PI < 4$ or plots below A-line (Fig. 4.2)
		CL	$PI > 7$ and plots on or above A-line (Fig. 4.2)
		CL-ML	PI plots in the hatched area (Fig. 4.2)
		OL	$\frac{LL_{(oven\ dried)}}{LL_{(not\ dried)}} < 0.75$; PI plots in the OL area in Fig. 4.2
	Silts and Clays	MH	PI plots below A-line (Fig. 4.2)
		CH	PI plots on or above A-line (Fig. 4.2)
		OH	$\frac{LL_{(oven\ dried)}}{LL_{(not\ dried)}} < 0.75$; PI plots in the OH area in Fig. 4.2
	Highly organic matter	Pt	Peat

Note: C_u = uniformity coefficient = $\frac{D_{60}}{D_{10}}$; C_z = coefficient of gradation = $\frac{D_{30}^2}{D_{60} \times D_{10}}$

LL = liquid limit on minus 40 sieve fraction

PI = plasticity index on minus 40 sieve fraction

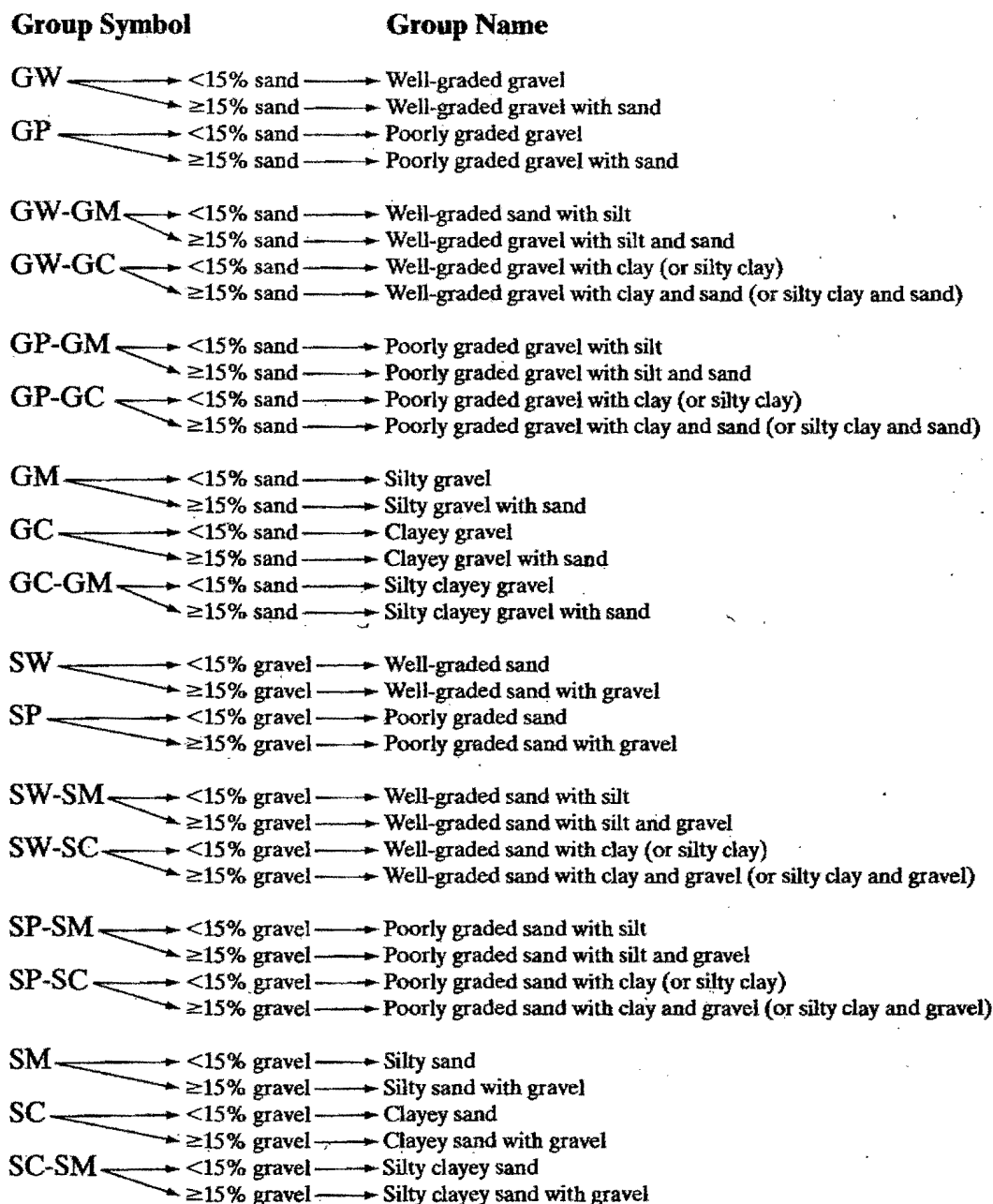
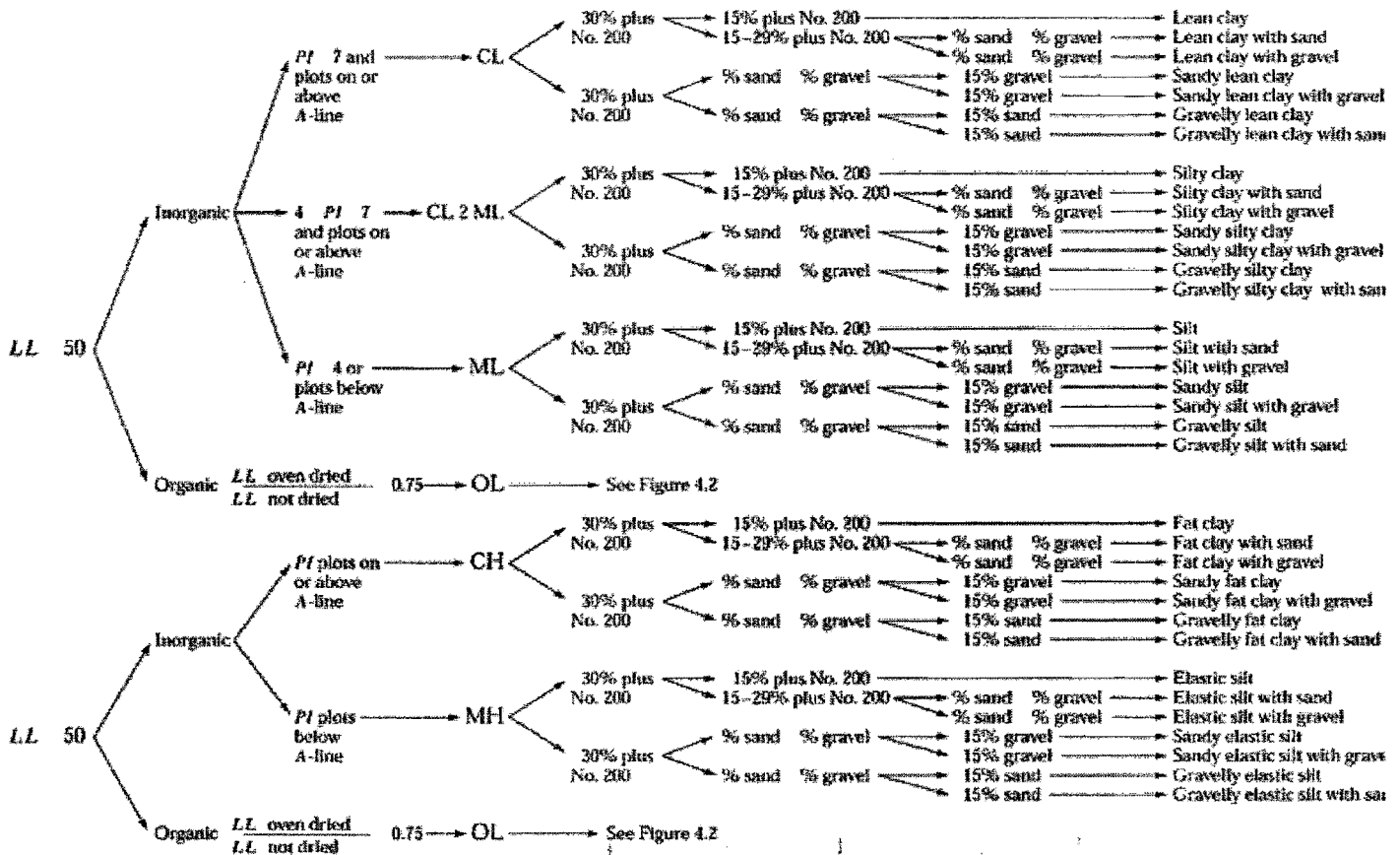
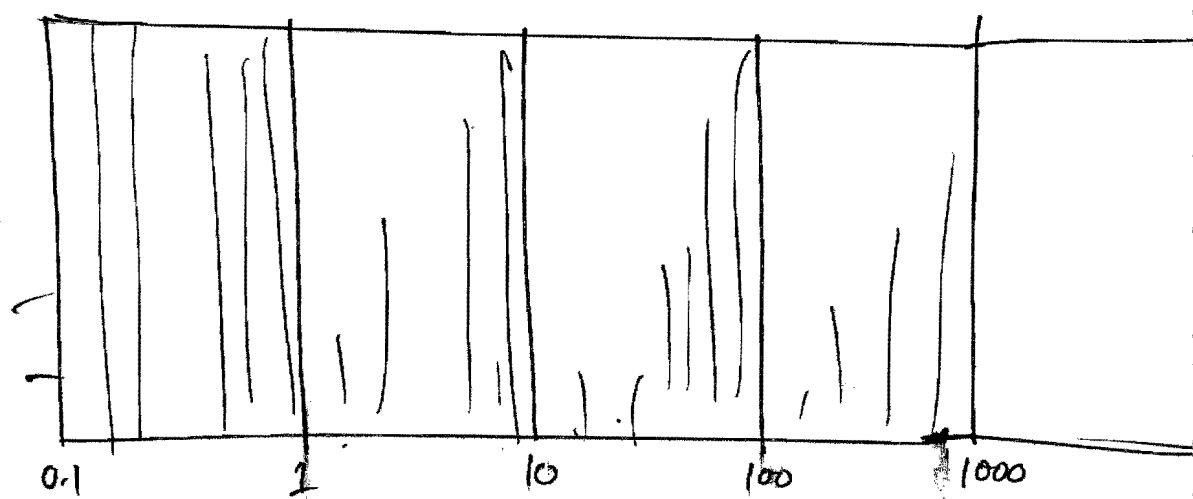


Figure 4.3 Flowchart group names for gravelly and sandy soil. *Source:* From "Annual Book of ASTM Standards, 04.08." Copyright © 1999 American Society for Testing and Materials. Reprinted with permission.

Group symbol

Group name







UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Hidraulogi
(Engineering Hydrology)

KNS 3143

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 8 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 a.m. – 12.00 p.m.
Tempat <i>(Place)</i>	: Bilik Seminar 12	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	Puan Rosmina Ahmad Bustami Prof. Madya Dr Nabil Bessaih		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

The precipitation gage for station Y was inoperative during a few days in February. For that same period, the precipitation at four index stations, each located in one of four quadrants, is the following [4 marks]

Quadrant	Precipitation (mm)	Distance (Km)
I	28	12.5
II	31	10.2
III	32	7.6
IV	35	19.0

Estimate the missing precipitation data at station Y.

Question 2

Test the consistency of a record of 25 years of annual rainfall of a rain gage designated as A. Mean annual rainfall for five neighboring stations located in a meteorologically homogenous region is available. [8 marks]

Indicate the year in which the change in rainfall regime occurred. Adjust the annual rainfall of a rain gage A, and compute the difference between the recorded and the adjusted rainfall for this gage.

Year	Rain Gage A	5 Rain-Gage Mean
1956	142	114
1957	115	106
1958	142	117
1959	130	118
1960	155	129
1961	134	124
1962	157	122
1963	115	94
1964	128	102
1965	157	154
1966	113	125
1967	126	131
1968	116	124
1969	106	114
1970	76	92
1971	118	108
1972	114	130
1973	112	108
1974	104	114
1975	110	104
1976	104	117
1977	130	129
1978	125	140
1979	140	133
1980	145	163

Question 3

A storm produces the following rainfall event:

[4 marks]

Time (hr)	Intensity (cm/h)
0-1	4
1-2	2
2-3	3
3-4	1
4-5	0

The amount of surface runoff produced by this storm is 2 cm.

Determine the Φ index.

Question 4

Given the stream section shown below and the following measurements:

Measurement Point	Distance Across Stream (m)	Average Depth, D (m)	Mean Velocity, V (m/s)
A	0	0	0
B	2	1	0.55
C	5	3.2	0.78
D	10	5.5	1.0
E	15	7.2	1.1
F	18	6.3	0.95
G	21	5.3	0.87
H	24	4.0	0.74
I	26	2.1	0.65

- Sketch the stream cross section. **[2 Marks]**
- Calculate the total discharge. **[8 Marks]**
- Calculate average velocity throughout the stream. **[2 Marks]**

Question 5

Given the following inflow hydrograph to a certain stream channel reach,

Time (h)	Inflow (m ³ /s)
1	10
2	20
3	40
4	80
5	120
6	150
7	120
8	60
9	50
10	40
11	30
12	20
13	10

Assume $K = 1$ h, $x = 0.2$.

- Calculate the outflow by the Muskingum method. [8 Marks]
- Compute the outflow on the fifth hour for the river reach using the Muskingum crest-segment routing. [4 Marks]

Given:

$$Q_2 = C_0 I_2 + C_1 I_1 + C_2 Q_1$$

$$C_0 = (-Kx + 0.5\Delta t) / C_3 \quad C_1 = (Kx + 0.5\Delta t) / C_3$$

$$C_2 = (K - Kx - 0.5\Delta t) / C_3 \quad C_3 = K - Kx + 0.5\Delta t$$

$$Q_j = \sum_{i=1}^j k_i I_{j-i+1} \quad \text{where: } k_1 = C_0$$

$$k_2 = C_0 C_2 + C_1$$

$$k_i = k_{i-1} C_2 \quad i > 2$$

Question 6

Given the following 2-hr unit hydrograph for a drainage basin, determine hourly ordinates of the 3-hr unit hydrograph: [10 Marks]

Time (hr)	0	1	2	3	4	5	6
Q (cfs)	0	50	300	400	200	50	0



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

LUKISAN KEJURUTERAAN
(ENGINEERING DRAWINGS)

KNS 1022

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 8 th November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm to 4.00 pm
Tempat <i>(Place)</i>	: DK 1	Jangkamasa <i>(Duration)</i>	: 2 jam
Pensyarah <i>(Lecturer)</i>	: MS TING SIM NEE		




- Arahan**
(Instruction)
1. **Jawab semua soalan.**
(Answer all questions)
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Question 1:

- a. Describe the various terms associated with dimensioning, stating the type of dimensions and their respective usages. You can use example to do so. (9 marks)
- b. Name three (3) dimensioning do or don'ts. (3 marks)
- c. Name two (3) lettering dos or don'ts with proper lettering technique. (3 marks)

Total marks for Question 1: 15 marks

Question 2:

- a. Name the following lines and their application accordingly:
- i.  (6 marks)
- ii. 
- iii. 
- b. Draw a circle and square with the proper construction techniques with appropriate lines. (9 marks)

Total marks for Question 2: 15 marks

Question 3:

Draw the symbols for the following items in:

a. Civil Drawing:

- Pillar hydrant
- Sluice Valve
- Sewer Manhole
- Concrete footpath
- Verge
- Entrance Crossover (12 marks)

b. Architectural Drawings

- Sink
- Bath
- Cavity Sliding doors
- Louver windows

(8 marks)

c. Structural Drawing: Reinforced Concrete Design

- Column Cross Section with size 200mm X 200mm and REO of 4Y20 and Stirrups of R8 ~ 300mm

(5 marks)

d. Structural Drawing: Steel Design

- Butt Weld
- Fillet Weld

(5marks)

Total marks for Question 3: 30 marks

Question 4:

a. With a given road reserve, what would a detailer do to detailing roadwork and how should he arrange the roads, footpaths, turfs, concrete verge and drain in roadwork drawings? You can describe with an example.

(15 marks)

b. Describe the difference between open drains and culverts.

(5 marks)

Total marks for Question 4: 20 marks

Question 5:

a. In Reinforced Concrete Design what do the following terms stand for?

- 4Y16
- R8- 200mm

(4 marks)

b. What is the usage for cover in reinforced concrete detailing?

(4 marks)

- c. What is the difference between a stump, a pile cap and a pier cap?
(5 marks)
- d. What is difference between a pile cap and a footing?
(4 marks)
- e. For beam detailing, how many views would a detailer generally draw? Describe each view with what each view is trying to indicate.
(8 marks)

Total marks for Question 5: 25 marks

Question 6:

- a. What shape does a universal column (UC) have?
(2 marks)
- b. There are few types of connections available in steel works. Describe bolting in detail.
(6 marks)
- c. When connecting a UC to a footing with bolts and fillet welding, what is the essential **item** that forms part of the bolting work? Sketch the connection details from the side view.
(7 marks)

Total marks for Question 6: 15 marks



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Teori Struktur
(Theory of Structures)

KNS 2093

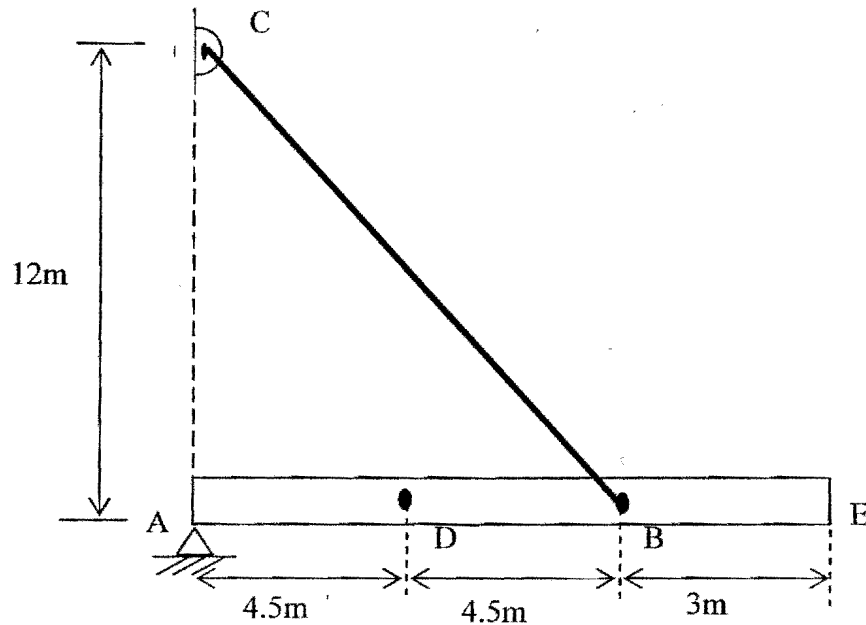
Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 8 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2 pm – 5 pm
Tempat <i>(Place)</i>	: BS 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Siti Noor Linda bt. Taib		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL the questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

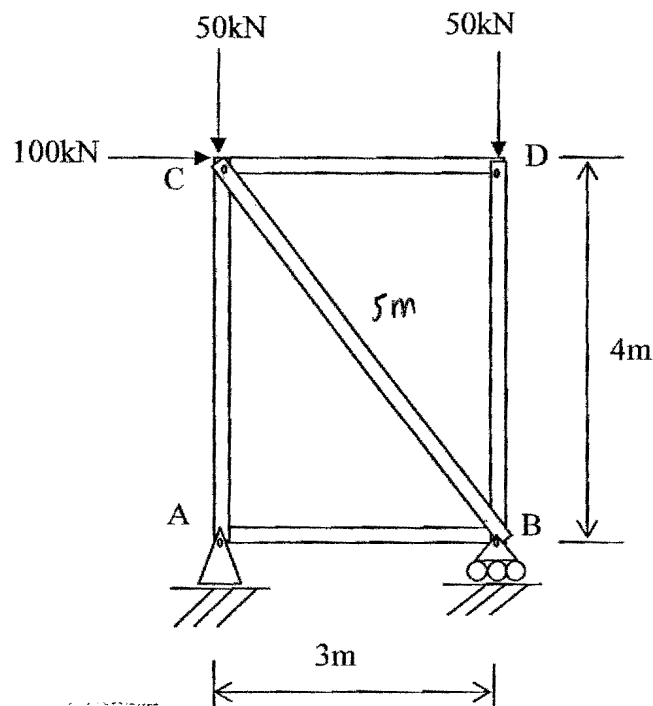
- Draw the influence line of moment at D for the below structure.
- Find maximum moment at D when a uniform load of 5 kN/m with length of 4.5 m passes the hanging beam.

[10marks]



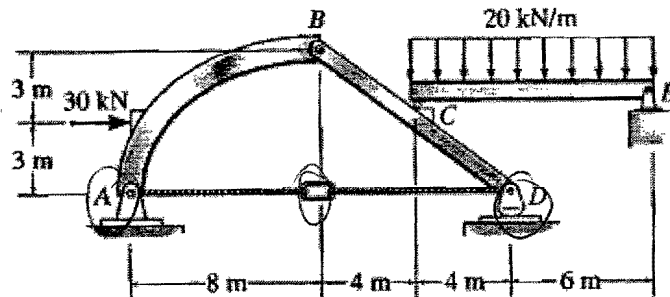
Question 2

- Determine the smallest cross-sectional area A required for the members of the truss shown, so that the horizontal deflection at joint D does not exceed 10 mm. Use the virtual work method. EA is constant and $E = 70$ GPa. [15marks]



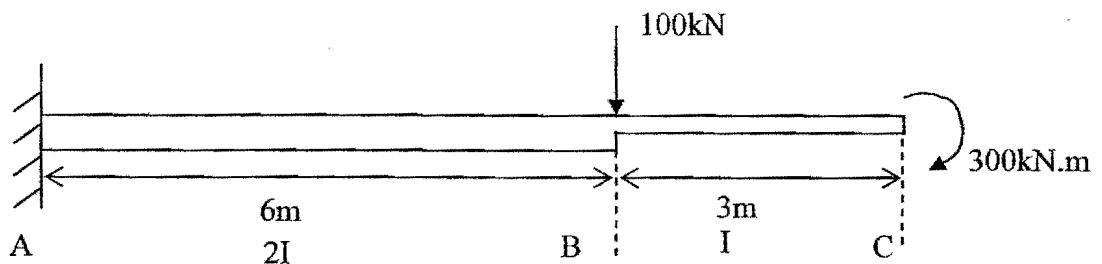
Question 3

The arch structure is subjected to the loading shown. Determine the [10marks]
horizontal and vertical components of reaction at A and D, and the force
in rod AD.



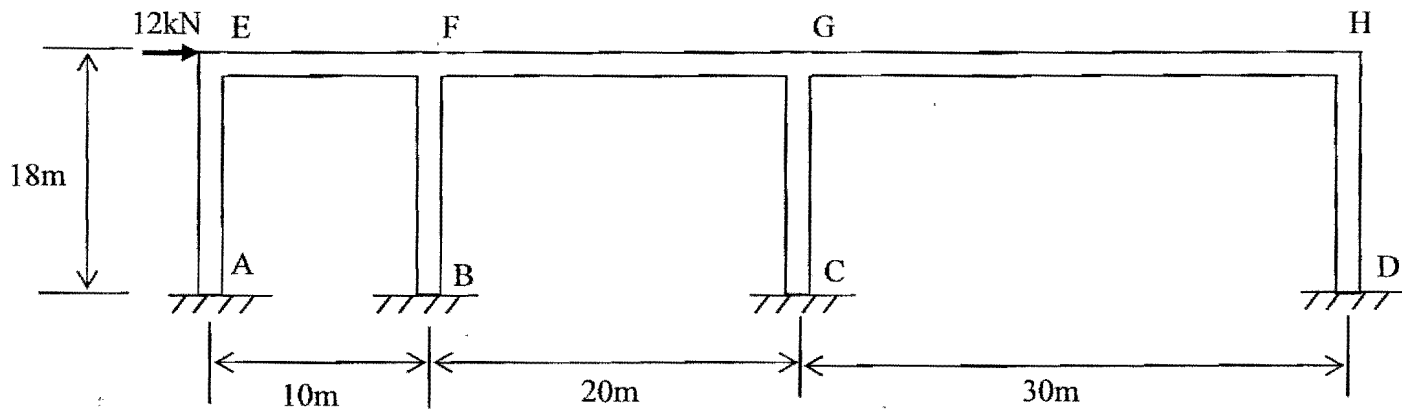
Question 4

Use the conjugate beam method to determine the slopes and deflections at [15marks]
points B and C of the beam shown. $E = \text{constant} = 70 \text{ GPa}$, $I = 500(10^6) \text{ mm}^4$.



Question 5

Using portal method in the approximate analysis, find the support reactions of the frame and draw moment diagram for girder EFGH. [20marks]





UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Bahan Kejuruteraan Sivil
(Civil Engineering Materials)

KNS 1043

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 9 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 11.00 am
Tempat <i>(Place)</i>	: Dewan Kuliah I	Jangkamasa <i>(Duration)</i>	: 2 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Mohammad Ibrahim Safawi Mohd Zain		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

(a) Calculate the mix design proportions for a grade 30 mix given the following:-

- a. Coarse aggregate 20mm maximum size, uncrushed
- b. Fine aggregate, 70% passing 600 micron, uncrushed
- c. Ordinary Portland cement (OPC)
- d. Slump 50 ± 25 mm
- e. Estimated wet density 2, 370 kg/m³

The standard deviation for more than 20 cubes was 4.8 N/mm². Assume 5% defectives and no exposure condition. In the laboratory class about 35kg of concrete is required for 12 cubes (100mm sides) and a small beam. Calculate the mass of components required for mixing

[14 marks]

(b) Given that the aggregates in the above mix have total moisture content of 3.5% and absorption of 1.2%. Calculate the revised quantities in kg/m³.

[6 marks]

Question 2

a) The production of solid timber sections involves four basic stages; felling, conversion, seasoning and grading. Felling does not affect the quality of timber and is part of the whole forestry process. Describe the process of conversion, seasoning and grading of timber.

[10 marks]

b) The properties of timber, which are important, depend on the particular application for which it is being considered. Outline the significance of the three properties below:

- a. Density
- b. Strength

[10 marks]

Question 3

a) Describe the process of manufacturing structural steel. Identify the types of raw materials used and the process involved in the production of structural steel. Use sketches to support your answer.

[13 marks]

b) Using diagram, explain the meaning of "Proof stress" and the reason for using it.

[7 marks]

Question 4

- (a) Masonry units can be classified into two categories; hollow and solid. List out four examples of solid units and two examples of hollow units. [6 marks]
- (b) In classifying the different types of masonry units, three physical properties are described. State down these three properties and give some numerical examples and units used. [9 marks]
- (c) With respect to masonry, explain the meaning of the following terms:
- Nominal size
 - Solid masonry units
 - Hollow masonry units
 - Weathering index
 - Paving bricks

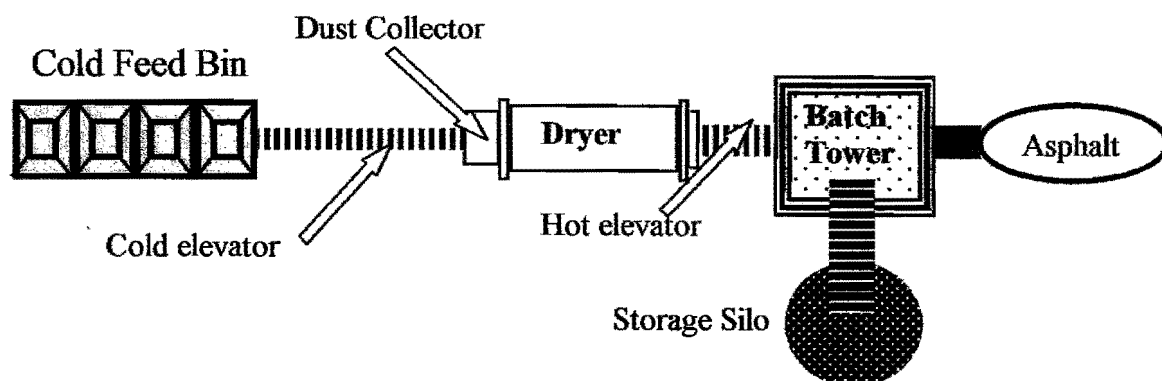
[5 marks]

Question 5

Figure 1 Batch Plant Layout

Figure 1 shows a layout of a hot mix batch plant. Describe the process of producing hot mixed asphalt by using the diagram above. What are the main features of a batch plant? Identify the kind of process occurring at the cold feed bin, dust collector, dryer, and asphalt storage.

[20 marks]

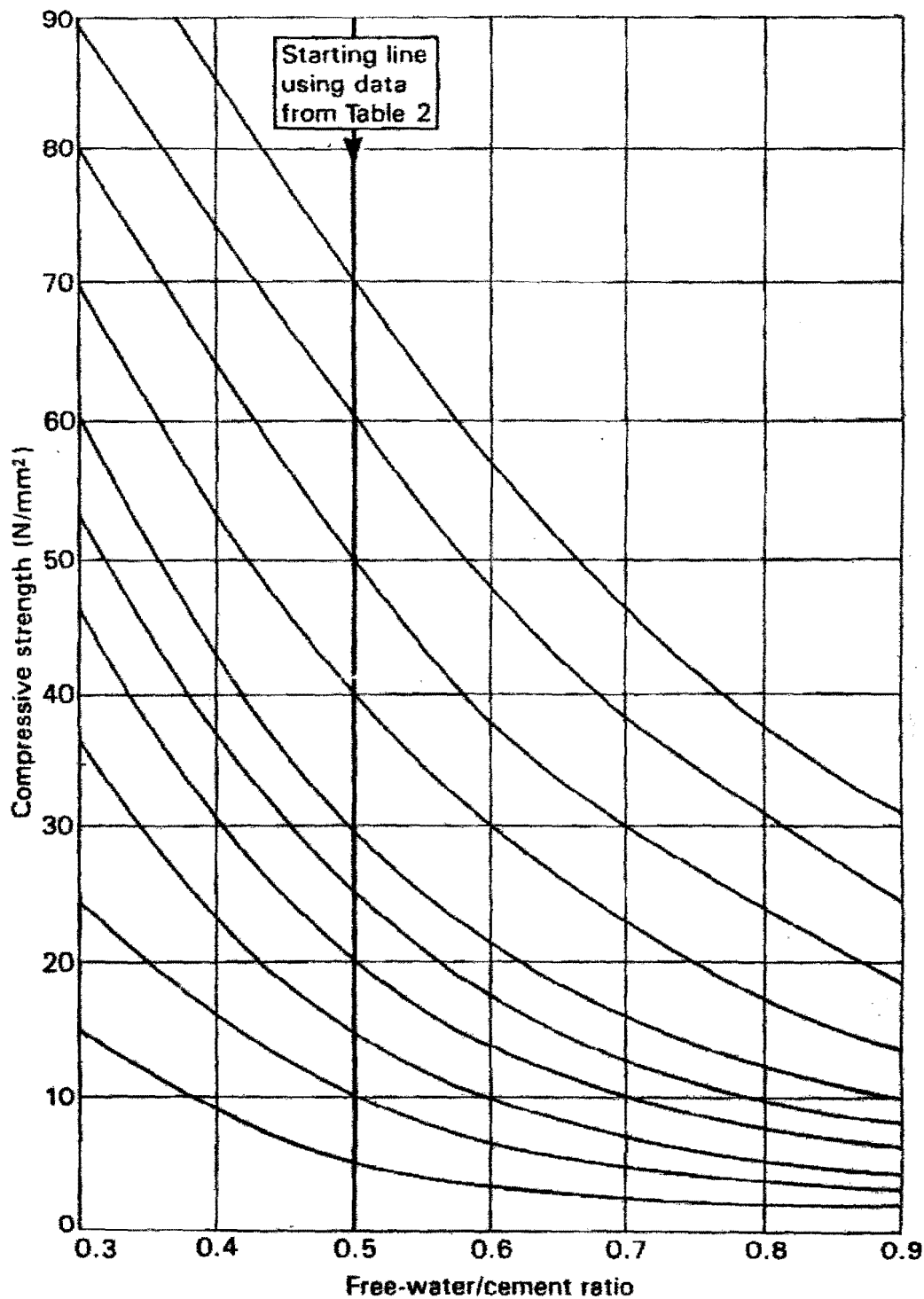


Approximate Free Water Content Required to Give Various Levels of Workability
According to the 1988 British Methods

Aggregate		Water Content (kg/m ³) for				
Max. size (mm)	Type	Slump (mm)	0-10	10-30	30-60	60-180
		Vebe time (s)	>12	6-12	3-6	0-3
10	Uncrushed		150	180	205	225
	Crushed		180	205	230	250
20	Uncrushed		135	160	180	195
	Crushed		170	190	210	225
40	Uncrushed		115	140	160	175
	Crushed		155	175	190	205

Approximate Compressive Strength of Concrete Made with a Free Water/Cement Ratio of 0.5. According to the 1988 British Method

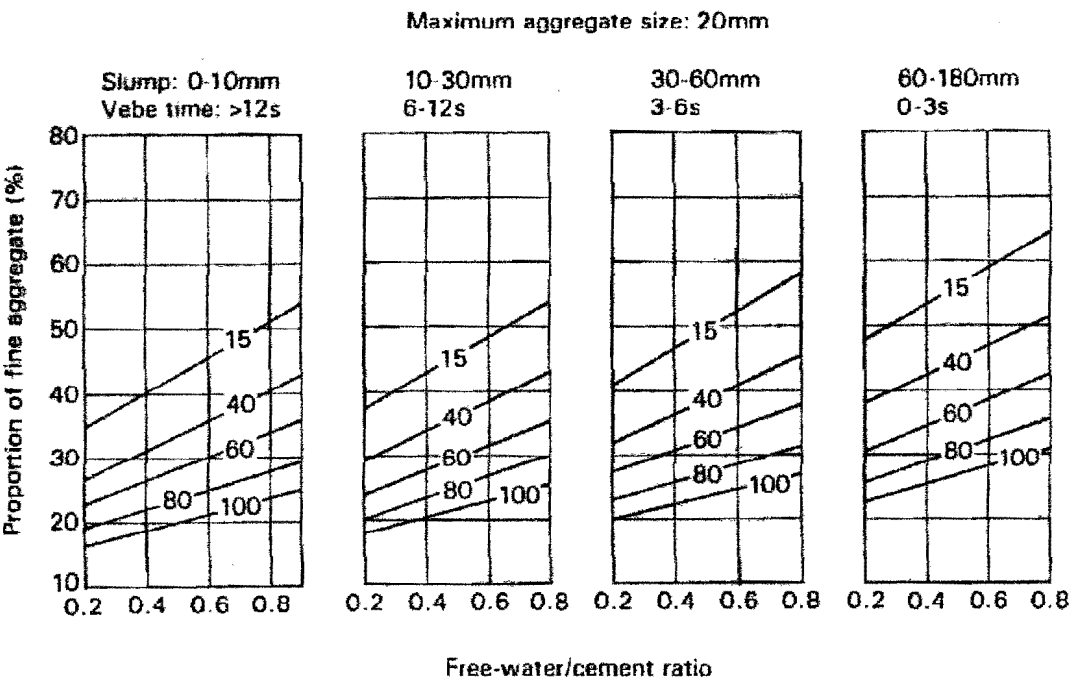
Type of cement	Type of coarse aggregate	Compressive strength (Mpa) at the age of (days)			
		3	7	28	91
Ordinary Portland (Type I)	Uncrushed	22	30	42	49
Sulfate-resisting Portland (Type V)	Crushed	27	36	49	56
Rapid-hardening Portland (Type III)	Uncrushed	29	37	48	54
	Crushed	34	43	55	61



RELATIONSHIP BETWEEN COMPRESSIVE STRENGTH AND FREE-WATER/CEMENT RATIO

Maximum aggregate size : 20mm

Slump: 30-60
Vebe time: 3-6s



RECOMMENDED PROPORTIONS OF FINE AGGREGATE ACCORDING TO
PERCENTAGE PASSING A 600 MICRON SIEVE



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Trafik
(Traffic Engineering)

KNS 4433

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 9 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 12.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 11	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Ir. Resdiansyah Mansyur		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

- a. What is the appropriate use of stop signs and give four (4) of the placement guidelines as stipulated in MUTCD for its application? Justify why a traffic signal could not be placed at every school crossing [5 marks]
- b. A rural freeway has an ideal free-flow speed of 120km/h and two lanes in each direction (i.e. 3.6 m per lane); with right shoulder lateral clearance of 1.2 m. Interchanges are spaced approximately 5 km apart. Traffic consists of 10 percent trucks and buses and 8 percent recreational vehicles. The adjustment for driver population factor is estimated to be 0.80. If the maximum 15-min flow rate is 1,760 veh/h, what is the level of services on 1.7 km long 3.1 percent upgrade? [15 marks]
- c. If generalized terrain for the freeway described in question 1 is rolling, how many lanes are required to provide level of service (LOS) B? [10 marks]

Question 2

- a. What is the level of service for the ramp combination and traffic condition shown in **Figure Q2a** below? (Given; PHF = 0.87. The terrain is level. Free-flow speed on the freeway is 100 km/h and free-flow speed on the ramps is 70 km/h.) [20 marks]

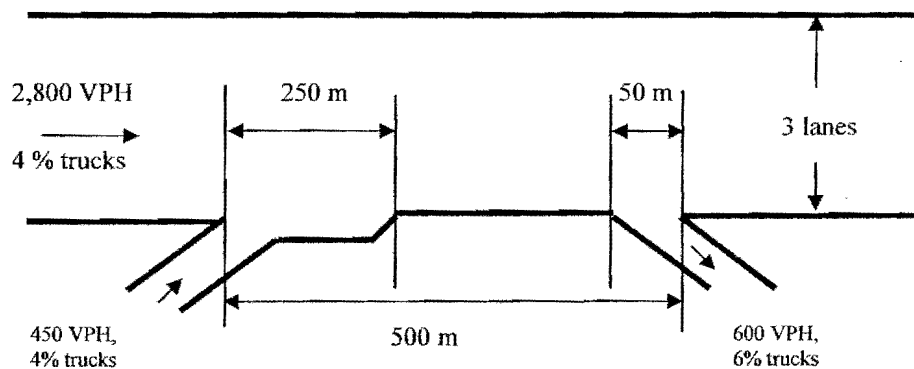


Figure Q1a. Ramps Combination

- b. **Figure Q2b** below shows a lane group at an intersection. The intersection is located in an outlying business district. Traffic includes 6 % heavy vehicles. The grade approaching the intersection is - 1.0 %. There are 15 parking maneuvers per hour and 4 bus blockages per hour. Right turns amount to 15 % of total flow; the adjustment for pedestrian/bicycle blockage for right turn is 0.993. There are no left turns, due to the adjacent left turn lane. Find the saturation flow rate for this lane group. [20 marks]

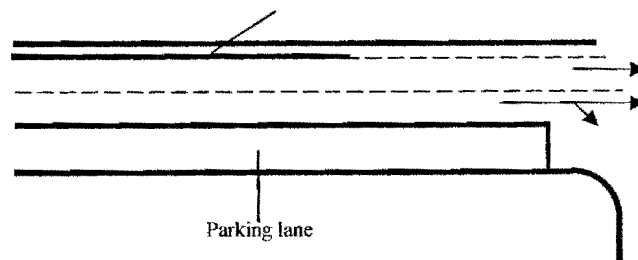


Figure Q2b. Lane group at an Intersection

Question 3

Flow ratios are given below for each lane group of an intersection. [15 marks]
Determine the minimum cycle length and phase lengths, using Highway Capacity manual method. Minimum greens are 15 s for each phase. Lost time is equal to the sum of the yellow intervals, which are 3 s each. The critical saturation ratio should be no more than 0.85. In the event adjustments are needed to provide the minimum green, the saturation ratio should be approximately the same for all critical lane groups and must be less than 0.85 in all cases. Prepare a timing plan giving the cycle and all intervals to the nearest tenth of a second.

Lane group	NBLT	SBLT	NB	SB	EB	WB
Flow ratio	0.18	0.16	0.22	0.25	0.20	0.22

Question 4

The north-south streets of a grid have block length of 140 m and the east-west streets have block lengths of 240 m. Desired speeds of progression are 50 km/h north-south and 40 km/h east-west. Determine the appropriate alternate systems, cycle, and actual speeds of progression for two-way progression in both orientations of the grid. Round the cycles to the nearest 5 s. [15 marks]

Table

Students are allowed to bring **Highway Capacity Manual (HCM-2000)**. All tables can be referred from this Manual

Formula

$$FFS = BFFS - f_{LW} - f_{LC} - f_N - f_{LD}; \quad f_{HV} = \frac{1}{1 + P_T(E_T - 1) + P_R(E_R - 1)}; \quad v_p = \frac{V}{PHF \times N \times f_{HV} \times f_P}$$

For $90 \leq FFS \leq 120$ and $(3,100 - 15FFS) < vp \leq (1,800 + 5FFS)$,

$$S = FFS - \left[\frac{1}{28} (23FFS - 1,800) \left(\frac{vp + 15FFS - 3,100}{20FFS - 1,300} \right)^{2.6} \right]$$

$$\text{For } 90 \leq FFS \leq 120 \text{ and } vp \leq (3,100 - 15FFS): S = FFS; D = \frac{vp}{S}; f_{HV} = \frac{1}{1 + p_T(E_T - 1)}; v_i = \frac{V_i}{PHF f_{HV} f_P}$$

$$L_{EQ} = \frac{v_D}{0.3596 + 0.001149L_A}; \quad D_R = 3.402 + 0.00456v_R + 0.0048v_{I2} - 0.01278L_A$$

$$L_{EQ} = \frac{v_U}{0.2337 + 0.000076v_F - 0.00025v_R}; \quad D_R = 2.642 + 0.0053v_{I2} - 0.0183L_D$$

$$f_W = 1 + \frac{W - 3.6}{9}; \quad f_{HV} = \frac{100}{100 + \%HV}; \quad f_g = 1 - \frac{\%G}{200}; \quad f_P = \frac{N - 0.1 - 18N_m / 3,600}{N}$$

$$f_{bb} = \frac{N - 14.4N_b / 3,600}{N}; \quad f_{RT} = 1.0 - 0.15P_{RT}; \quad S = S_o N f_w f_{HV} f_g f_P f_{bb} f_a f_{LU} f_{RT} f_{Rpb} f_{Lpb}$$

$$X_C = \sum_i (v_a / s) + \frac{L(v_a / s)_c}{g_c}; \quad C = \frac{X_c L}{X_c - \sum_{i,j \neq c} (v_a / s)_i}; \quad C = \frac{2NL}{S}$$



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Sumber Air
(Water Resources Engineering)

KNS 3193 / KNS 4193

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 9 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: Dewan Kuliah I	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: AP Dr. F.J. Putuhena , Rosmina bt. Ahmad Bustami		

Arahan
(Instruction)

1. **Jawab SEMUA soalan.**
(Answer any ALL questions).
2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1 Reservoir Assessment

- a) Reservoirs are important for storing water during rainy season to be used in the dry season. What are the criteria for selecting a good reservoir's location? [5 marks]
- b) For the reservoir of **Figure Q1b**, how much water may be stored between the minimum operating level and the normal pool level? How much water may be stored as surcharge storage? [5 marks]

Question 2 Reservoir Yield

What reservoir capacity is required to produce a yield (at uniform rate) of 1,000,000 m³/month? The monthly flow for the site, during a critical flow period, is as tabulated below. [20 marks]

Month	1967	1968	1969
January	0.34 m ³ /sec	0.07	0.80
February	0.22	0.17	2.07
March	1.02	1.17	2.18
April	0.26	0.47	0.17
May	0.18	0.21	0.50
June	0.14	0.16	0.40
July	0.10	0.11	0.28
August	0.08	0.08	0.21
September	0.07	0.07	0.17
October	0.05	0.05	0.99
November	0.03	0.47	2.75
December	1.28	0.10	1.05

Question 3 Drainage System

A 20 m-wide roadway has a 20-cm crown, a longitudinal slope of 0.035, and $n = 0.019$. The curb height is 15 cm. If the design rainfall is 60 mm/hr, and the maximum acceptable width of flow is 2 m, what is the maximum allowable distance between inlets? Assume coefficient run-off is 0.95 and no runoff onto the roadway from adjacent areas. [10 marks]

Question 4 Irrigation

- a) The root zone of a soil has a field capacity of 192 mm and a wilting point of 110 mm. The consumptive use of crops for July is 6.1 mm/day. Assuming no rainfall, how often ought a farmer to irrigate? How much water should be applied at each irrigation if there is to be no deep [10 marks]

percolation. Water will be delivered to the irrigated area by canal. Assuming a delivery loss of 20%, and 6 hours of delivery time, what would be the diversion requirement per hectare in L/s?

- b) What are the steps in irrigation system planning? [10 marks]

Question 5 Water Supply

Name the 3 types of distribution systems and their advantages and limitations. [10 marks]

Question 6 Flood Damage Mitigation

- a) Levees are most frequently used for flood mitigation because they can be built at relatively low cost of materials available at the site. Levees are usually built of material excavated from borrow pits paralleling the levee line. Levee cross sections must be adjusted to fit the site and the available materials. Please draw a typical levee cross section. [5 marks]
- b) Water flows at the rate of 5000 cfs in a river ($n = 0.045$) whose flow cross-section can be approximated as a rectangle 200 ft wide and 12 ft deep. If a bypass could be made available to divert 1500 cfs of the 5000 cfs, what would be the maximum drop in stage downstream of the bypass diversion? Assume a constant river width, bed slope, and Manning's n . [10 marks]

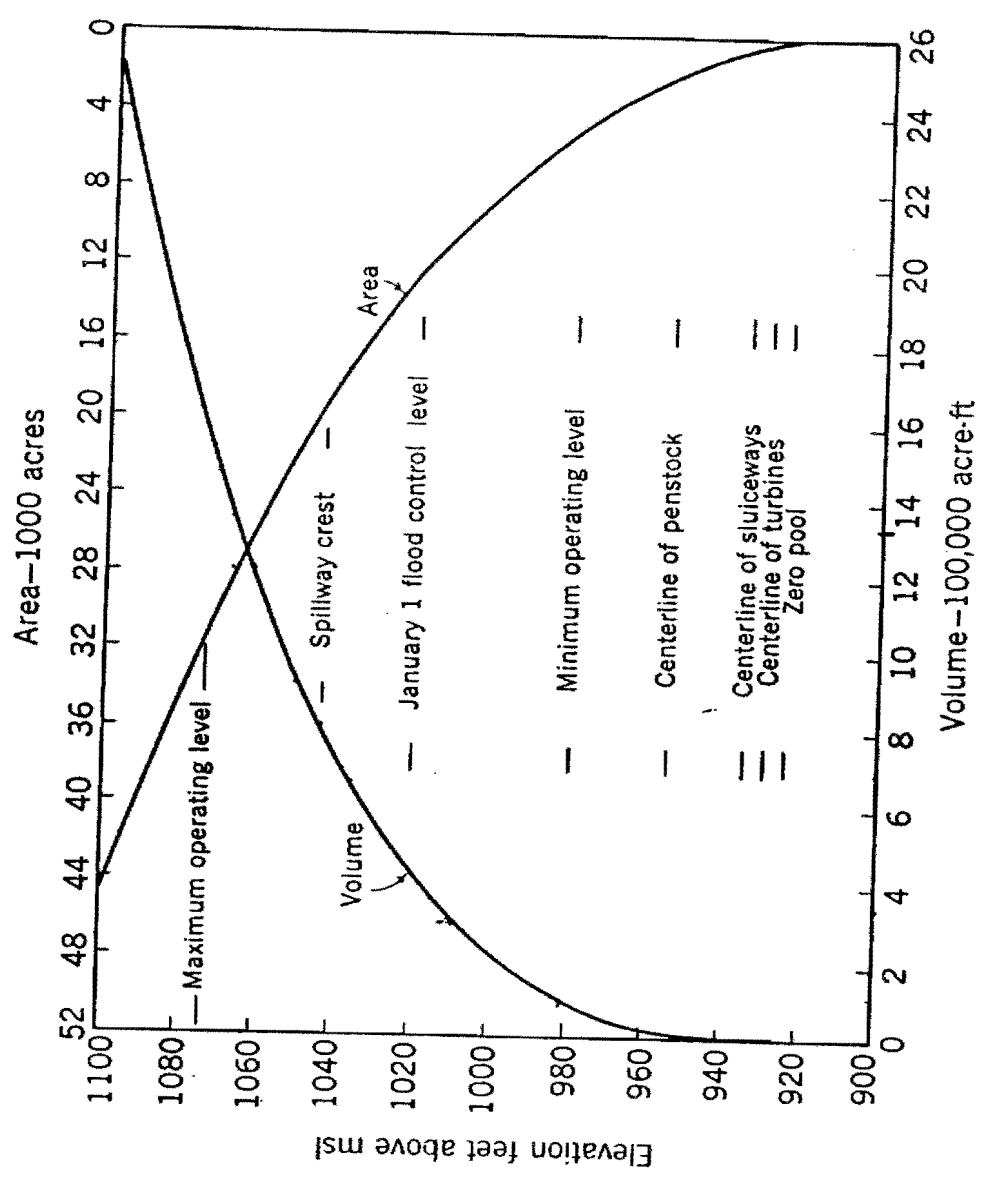
Question 7 Water Resources Planning

- a) Using the following data calculate the allocations to each project purpose by the remaining-benefits method and by the alternate justifiable-expenditure method. The estimated total cost of the project is \$ 12,900,000 [10 marks]

Item	Water supply (\$)	Flood Mitigation (\$)
Separable costs	5,200,000	7,100,000
Estimated benefits	6,400,000	11,300,000
Alternate single-purpose cost	6,900,000	9,500,000

- b) What are the environmental consequences of water-resources projects? (Please mention at least five consequences) [5 marks]

FIG. Q1b





UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Statik
(Statics)

KNS 1013

Peperiksaan : Akhir
(Examination)

Tarikh : 11 November 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 9.00 am – 12.00 pm
(Time)

Tempat : Dewan Kuliah I
(Place)

Jangkamasa : 3 jam
(Duration)

Pensyarah : En. Abdul Razak Abdul Karim
(Lecturer)

- Arahan** :
(Instruction)
1. Kertas peperiksaan ini mengandungi LIMA (5) soalan. Pilih dan jawab EMPAT (4) soalan sahaja.
(This examination paper consists of FIVE (5) questions. Choose and answer FOUR (4) questions only).
 2. Baca soalan dengan teliti sebelum menjawab.
(Read the questions carefully before answering)
 3. Tulis jawapan hanya di kertas soalan yang disediakan menggunakan pen sahaja.
(Write the answers only in the question paper provided using only pen)
 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.
(No talking or disturbing other candidates during the duration of test)
 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

QUESTION 1

The cables attached to the screw eye are subjected to the three forces as shown in Figure 1 below.

- Express each forces in Cartesian vector form; [9 marks]
- Determine the magnitude of the resultant force; and [7 marks]
- Find the coordinate direction angles of the resultant force. [9 marks]

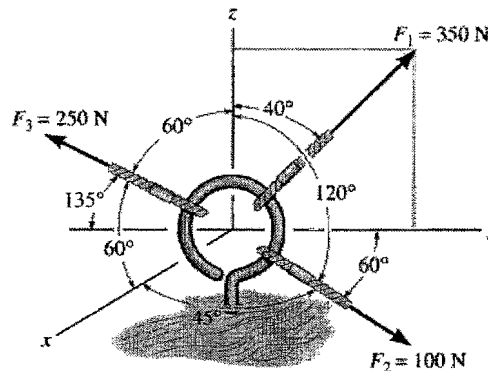


Figure 1

QUESTION 2

The force $\vec{F} = \{-40\hat{i} + 20\hat{j} + 10\hat{k}\}$ N acts at point A shown in Figure 2.

- Calculate and draw the moment components of this force about the x and a axes by using vector analysis. Given that, $M = \vec{u} \cdot (\vec{r} \times \vec{F})$; and [14 marks]
- Compute and draw the moment components of this force about the x , y and z axes by using scalar analysis. Given that, $M = \sum Fd$. [11 marks]

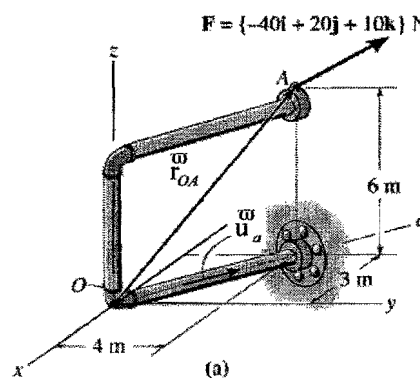


Figure 2

QUESTION 3

If the maximum force that any member can support is 8 kN in tension and 6 kN in compression (see Figure 3),

- Determine the force in each member of the truss; and [20 marks]
- Compute the maximum force P that can be supported at joint D . [5 marks]

Hint: In this case, the support reactions are not required for determining the member forces.

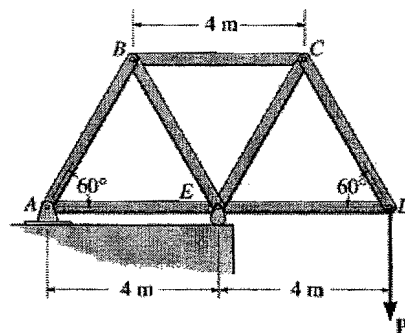


Figure 3

QUESTION 4

Determine the center of mass (\bar{z}) of the composite assembly shown in Figure 4. There is a 25 mm radius cylindrical hole in the center. Given that, the density of the conical frustum, $\rho_c = 8000 \text{ kg/m}^3$, density of the hemisphere $\rho_h = 4000 \text{ kg/m}^3$, and $\bar{z} = \frac{\sum \bar{z}m}{\sum m}$.

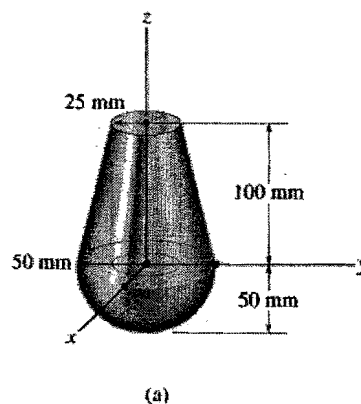


Figure 4

[25 marks]

QUESTION 5

The beam's cross-sectional area is shown in Figure 5.

a) Find the distance \bar{y} ; and

[10 marks]

b) Calculate the moment of inertia about the x' axis.

[15 marks]

Given that, $\bar{y} = \frac{\sum \bar{y}A}{\sum A}$ and $I_{x'} = \bar{I}_{x'} + Ad_y^2$.

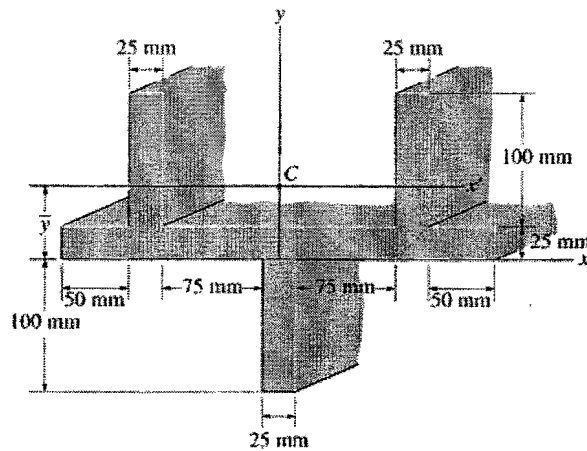
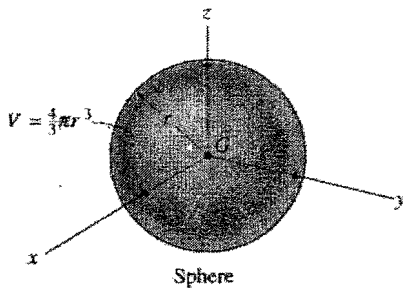
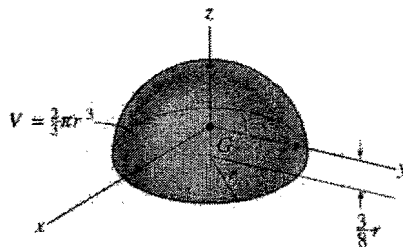


Figure 5

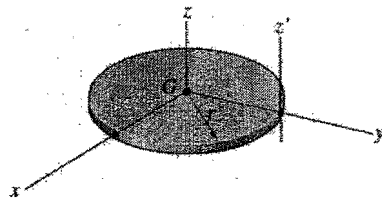
APPENDIX



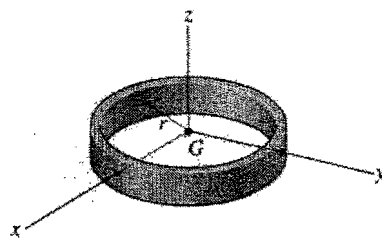
Sphere
 $I_{xx} = I_{yy} = I_{zz} = \frac{2}{5}mr^2$



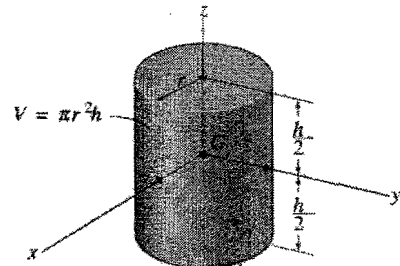
Hemisphere
 $I_{xx} = I_{yy} = 0.259mr^2$ $I_{zz} = \frac{2}{5}mr^2$



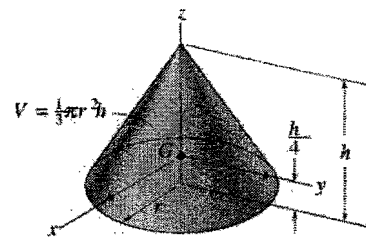
Thin Circular disk
 $I_{xx} = I_{yy} = \frac{1}{4}mr^2$ $I_{zz} = \frac{1}{2}mr^2$ $I_{zz'} = \frac{3}{2}mr^2$



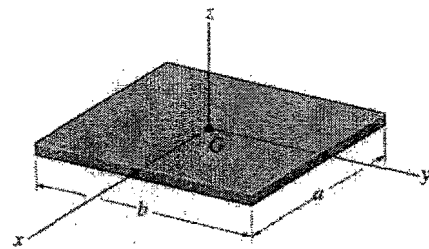
Thin ring
 $I_{xx} = I_{yy} = \frac{1}{2}mr^2$ $I_{zz} = mr^2$



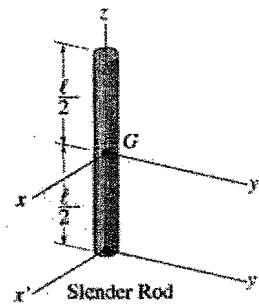
Cylinder
 $I_{xx} = I_{yy} = \frac{1}{12}m(3r^2 + h^2)$ $I_{zz} = mr^2$



Cone
 $I_{xx} = I_{yy} = \frac{3}{80}m(4r^2 + h^2)$ $I_{zz} = \frac{3}{10}mr^2$



Thin plate
 $I_{xx} = \frac{1}{12}mb^2$ $I_{yy} = \frac{1}{12}ma^2$ $I_{zz} = \frac{1}{12}m(a^2 + b^2)$



Slender Rod
 $I_{xx} = I_{yy} = \frac{1}{12}ml^2$ $I_{zz'} = I_{yy'} = \frac{1}{3}ml^2$ $I_{zz''} = 0$



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Geologi Kejuruteraan
(Engineering Geology)

KNS 2102

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 11 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.30 pm – 5.30 pm
Tempat <i>(Place)</i>	: Dewan Kuliah I	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Azhaili Baharun		

- Arahan**
(Instruction)
- 1. Jawab EMPAT soalan sahaja.**
(Answer FOUR questions only).
 - 2. Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 - 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 - 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 - 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

- a) Explain about the **core** of our earth. [8 marks]
- b) What causes **positive and negative magnetic anomaly**? [6 marks]
- c) Explain on the origin of these igneous rocks: **Mafic, Intermediate and Felsic**. [6 marks]
- d) What is **geothermal gradient** and its average value. [5 marks]

Question 2

- a) What is the difference between **granite** and **rock salt**? [5 marks]
- b) Boreholes are holes, normally vertical, drilled into the ground to obtain subsurface samples. List down and explain the methods used for boring into:

- 1. soils
- 2. rocks [20 marks]

Question 3

- a) What is mass wasting? [3 marks]
- b) What are magma, lava, extrusive and intrusive rocks? [12 marks]
- c) List five sources of heat for melting in the crust [10 marks]

Question 4

- a) Explain about **mechanical weathering** process and 4 types of the processes. [15 marks]
- b) Explain about **chemical weathering process** and 2 types of the processes. [10 marks]

Question 5

- a) What is the paradigm of Plate Tectonics? [5 marks]

b) Please draw or sketch

i) Folds of 1. Recumbent, 2. Upright, 3. Isoclinal, 4. Anticlines, 5. Synclines 6. Monoclines

ii) Faults of 1. Thrust and Reverse, 2. Normal, 3. Strike-slip, 4. Horst and Graben

[20 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

KEJURUTERAAN GEOTEKNIKAL LANJUTAN
(Advanced Geotechnical Engineering)

KNS 4273

Peperiksaan <i>(Examination)</i>	: Peperiksaan Akhir	Tarikh <i>(Date)</i>	: 11 th November 2005
Semester	: I Sesi 2005/2006	Masa <i>(Time)</i>	: 2.30 pm – 5.30 pm
Tempat <i>(Place)</i>	: Bilik seminar 9	Jangkamasa <i>(Duration)</i>	: 3 Jam
Pensyarah <i>(Lecturer)</i>	: Dr. Prabir Kumar Kolay		

- Arahan**
(Instruction)
1. **Semuanya ada SEPULUH soalan. Jawab SOALAN NO. 1 dan TUJUH soalan yang lain.**
(There are TEN questions. Answer QUESTION NO. 1 and SEVEN from the rest)
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam kertas jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer sheets provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

There are **TEN** questions. Answer **QUESTION NO. 1** and **ANY SEVEN** from the rest. (*Assume reasonable value(s) of any data, if missing. Answer should be brief and to the point. The figures in the margin indicate full marks*)

Question 1 (*Compulsory Question*) Answer any 6 (Six) of the following questions:

[6 × 5 = 30 Marks]

- (a) Name various ground modification techniques. What are the major benefits of the cement-soil stabilization?
- (b) State the advantages of grouting process. What is groutability ratio?
- (c) Explain briefly the principles of geotechnical centrifuge.
- (d) State the different methods of dewatering system. Discuss briefly the well point method with neat sketch.
- (e) With neat sketch, indicate the various features of landslides in cohesive soil.
- (f) How do you classify the landslides with respect to the shape of the sliding surface and creep movement?
- (g) What are the common types of soil-reinforcement generally used? State the beneficial effects of soil reinforcement.
- (h) Explain briefly the critical state of soil.
- (i) What are the main requirements for designing the filter material?
- (j) Classify dam according to their use, hydraulic design and the materials used.

Question 2

A soft clay layer, 6 m thick, is consolidated with the help of drain well or sand drain of diameter 30 cm and spaced at 3.0 m centre to centre. Determine the influence of sand drains on the average degree of consolidation at the time when the degree of consolidation in the soft clay without well or sand drains would be equal to 25%. Sand drains of 30 cm diameter are provided in a square grid pattern at 3 m apart. Given, $R = 0.564 \times l$ and Use Table 1, if necessary.

Compute the average degree of consolidation of the clay strata with sand drains for the time when the degree of consolidation without drains would be equal to 25% when

- (i) The soil is isotropic; (ii) The radial permeability, $k_r = 2 k_z$

[10 Marks]

Question 3

- (a) The following data are given for an under-reamed ground anchor in cohesive soil. The soil is saturated even above the GWT because of capillary rise. The saturated unit weight of the soil is 18 kN/m^3 .

Diameter of under-ream bell	= 0.16 m
Shaft diameter	= 0.05 m
Distance between adjacent reams	= 0.75 m
Undrained cohesion of soil	= 60 kN/m^2
Soil friction resistance, ϕ	= 0°
Depth of anchor at mid point	= 5.0 m
Water table	= 1.5 m below ground surface
Bearing capacity factor, N_c	= 9

Calculate the ultimate capacity of the anchor. [5 Marks]

- (b) Discuss why seepage control is necessary in embankment dam. Name three methods of seepage control in embankment dam. [5 Marks]

Question 4

From oedometer and triaxial tests on a normally consolidated recent shallow lake clay the following parameters have been obtained:

$$\gamma = 18.0 \text{ kN/m}^3, M = 1.09, \Gamma = 2.51, e_0 = 1.59 \text{ and } C_c = 0.299$$

Using the critical state theory, draw up a predicted c_u versus depth profile for depths down to 40 m, assuming the water table to be at the surface.

[10 Marks]

Question 5

- (a) What are the main functions of using geosynthetics for construction project? [3 Marks]

- (b) A masonry dam 50 m long and overlying an impermeable soil is founded on a soil with anisotropy in permeability. The upstream water level is 9.6 m., and the tail water level is 0.6 m above the ground level. The vertical permeability of the soil is 1.39 m/day and the horizontal permeability is 6 times as that of vertical permeability. The flow net drawn on a transformed section yields 5 flow channels and 8 equipotential lines. Determine the seepage flow per day. [7 Marks]

Question 6

An earthen dam made of homogeneous material has the following data:

Level of the top of the dam	= 200.0 m
Level of deepest river bed	= 178.0 m
H.F.L. of reservoir	= 197.5 m
Width of top of dam	= 4.5 m
Upstream slope	= 3 : 1
Downstream slope	= 2 : 1
Length of horizontal filter from d/s toe inward	= 25 m
Dry unit weight (<i>dam material</i>)	= 18 kN/m ³
Submerged unit weight (<i>dam material</i>)	= 12 kN/m ³
Ave. angle of internal friction (<i>dam material</i>)	= 25°
Average cohesion (<i>dam material</i>)	= 24 kN/m ²
Dry unit weight (<i>foundation material</i>)	= 18.3 kN/m ³
Ave. angle of internal friction (<i>foundation material</i>)	= 12°
Average cohesion (<i>foundation material</i>)	= 54 kN/m ²
Thickness of clay foundation soil layer	= 8 m

Check the overall factor of safety of foundation against shear.

[10 Marks]

Question 7

A 8.0 m high retaining wall with galvanized steel-strip reinforcement in a granular backfill has to be constructed. The following data are given:

Granular backfill: $\gamma_1 = 17 \text{ kN/m}^3$; $\phi_1 = 35^\circ$

Galvanized steel reinforcement:

Width of strip, $w = 80 \text{ mm}$;

Vertical spacing, $S_v = 0.6 \text{ m}$ center to center;

Horizontal spacing, $S_h = 1.0 \text{ m}$ center to center;

$f_y = 250 \text{ Mpa}$; $\phi_u = 20^\circ$;

F.S. against tie breaking, $FS_{(B)} = 3$;

F.S. against tie pullout, $FS_{(P)} = 3$.

Check only for internal stability of the retaining wall.

[10 Marks]

Question 8

- (a) What is fixed length and free length of a ground anchor?

[3 Marks]

- (b) A clay layer, 8 m thick, is subjected to a pressure of 70 kN/m^2 . If the layer has a double drainage and undergoes 50% consolidation ($T_v = 0.196$) in one year, determine the co-efficient of consolidation, C_v .

If the co-efficient of permeability, K is 0.040 m/year , determine the settlement in one year. Use $\gamma_w = 9.81 \text{ kN/m}^3$.

[7 Marks]

Question 9

Derive an expression for FOS (Factor Of Safety) against sliding for the stability of the downstream slope portion of the dam and also against the point of maximum shear of downstream slope.

[10 Marks]

Question 10

A geotextile-reinforced retaining wall is 8 m high. For the granular backfill, $\gamma_1 = 16 \text{ kN/m}^3$ and $\phi_1 = 28^\circ$. For the geotextile, allowable fabric strength, $\sigma_G = 17 \text{ kN/m}$. For the design of the wall, determine S_v , L , and l_t . Assume the friction angle at geotextile-soil interface, $\phi_F = \frac{2}{3} \phi_1$ and $FS_{(B)} = FS_{(P)} = 1.5$

[10 Marks]

Table 1: Chart for Question no. 3

U _r (%)	Time factor, T _r								
	n = R/r _w = 5	10	15	20	25	30	50	80	100
5	0.006	0.010	0.013	0.014	0.016	0.017	0.020	0.023	0.025
10	0.012	0.021	0.026	0.030	0.032	0.035	0.042	0.048	0.051
15	0.019	0.03	0.040	0.046	0.050	0.054	0.064	0.074	0.079
20	0.026	0.044	0.055	0.063	0.069	0.074	0.088	0.101	0.107
25	0.034	0.057	0.071	0.081	0.089	0.096	0.144	0.131	0.139
30	0.042	0.070	0.088	0.101	0.110	0.118	0.141	0.162	0.172
35	0.050	0.085	0.106	0.121	0.133	0.143	0.170	0.196	0.208
40	0.060	0.101	0.125	0.144	0.158	0.170	0.202	0.232	0.246
45	0.070	0.118	0.147	0.169	0.185	0.198	0.236	0.291	0.288
50	0.081	0.137	0.170	0.195	0.214	0.230	0.274	0.315	0.334
55	0.094	0.157	0.197	0.225	0.247	0.265	0.316	0.363	0.385
60	0.107	0.180	0.226	0.258	0.283	0.304	0.362	0.416	0.441
65	0.123	0.207	0.259	0.296	0.325	0.348	0.415	0.477	0.506
70	0.137	0.231	0.289	0.330	0.362	0.389	0.463	0.532	0.564
75	0.162	0.273	0.342	0.391	0.429	0.460	0.548	0.629	0.668
80	0.188	0.317	0.397	0.453	0.498	0.534	0.636	0.730	0.775
85	0.222	0.373	0.467	0.534	0.587	0.629	0.750	0.861	0.914
90	0.270	0.455	0.567	0.649	0.712	0.764	0.911	1.046	1.110
95	0.351	0.590	0.738	0.844	0.926	0.994	1.185	1.360	1.444
99	0.539	0.907	1.135	1.298	1.423	1.528	1.821	2.091	2.219

Formulae

$$t = \frac{(\sigma_a S_V S_H) [FS_{(B)}]}{w f_y}; \quad L = \frac{(H - z)}{\tan\left(45^\circ + \frac{\phi_1}{2}\right)} + \frac{FS_{(P)} K_a S_V S_H}{2 w \tan \phi_\mu}; \quad b = \sqrt{\frac{V_g}{0.78 L_0}}$$

$$c_u = \frac{1}{2} M \exp\left(\frac{\Gamma - N_0 + \lambda \ln p'_z}{\lambda}\right); \quad Q_u = \frac{\pi}{4} (D^2 - d^2) N_c \cdot c_u + \pi D \cdot l \cdot c_u; \quad C_c = \frac{\Delta e}{\log(\sigma_1 / \sigma_0)}$$

$$S_V = \frac{\sigma_G}{(\gamma_1 z K_a) [FS_{(B)}]}; \quad L = \frac{(H - z)}{\tan\left(45^\circ + \frac{\phi_1}{2}\right)} + \frac{FS_{(P)} K_a S_V}{2 \tan \phi_F}; \quad l_l = \frac{S_V K_a [FS_{(P)}]}{4 \tan \phi_F}$$

$$\phi_1 = \tan^{-1} \left[\frac{c_{fs} + \gamma_{eq} (h + h_3) \tan \phi_{fs}}{\gamma_{eq} (h + h_3)} \right]; \quad \gamma_{eq} = \frac{\gamma_{dry(dam)} \times h + \gamma_{dry(foundation)} \times h_3}{h + h_3}$$

$$p'_z = \frac{1}{3} (\sigma'_v + 2 \sigma'_h); \quad \lambda = C_c / 2.3; \quad 1 - U = (1 - U_z) \cdot (1 - U_r); \quad N_0 = 1 + e_0; \quad T_v = \frac{C_v t}{d^2}$$

$$k = C_v \cdot m_v \cdot \gamma_w; \quad q = k_e \times H_e \times \frac{N_f}{N_d}; \quad T_r = \frac{c_{vr}}{(2R)^2} t; \quad \Delta H = m_v \cdot \Delta p \cdot H_0$$

$$S = \frac{H C_c}{(1 + e_0)} \cdot \log_{10} \left(\frac{\sigma_0 + \Delta \sigma}{\sigma_0} \right); \quad P = \gamma_{eq} \left[\frac{(h + h_3)^2 - h_3^2}{2} \right] \left[\tan^2 \left(45^\circ - \frac{\phi_1}{2} \right) \right]$$



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Teknologi Perumahan
(Housing Technology)

KNB 4043

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 11 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.30 pm – 5.30 pm
Tempat <i>(Place)</i>	: Bilik Seminar 11	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Siti Halipah Ibrahim		

- Arahan**
(Instruction)
- 1. Jawab SEMUA soalan.**
(Answer ALL questions).
 - 2. Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 - 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 - 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 - 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

Contrast the basic differences between **housing** as a “noun” and as a “verb”.

[10 marks]

Question 2

Describe **three** aspects that should be considered when measuring the success of a housing development.

[12 marks]

Question 3

Explain with the aid of simple sketches **four** differences between traditional Malay house design and modern housing design, shows the suitability of the former design in hot humid climates.

[16 marks]

Question 4

- (a) Define the term of ‘thermal comfort’. **[2 marks]**
- (b) Describe 3 mechanisms of body’s heat loss to its environment. **[6 marks]**
- (c) Using the values given below, determine the Corrected Effective Temperature (CET) value from the psychrometric chart (**Figure 1**) and the Corrected Effective Temperature nomogram (**Figure 2**). **[4 marks]**

Air temperature - 29.5°C
Relative humidity - 70 %
Air velocity - 0.5 m/s

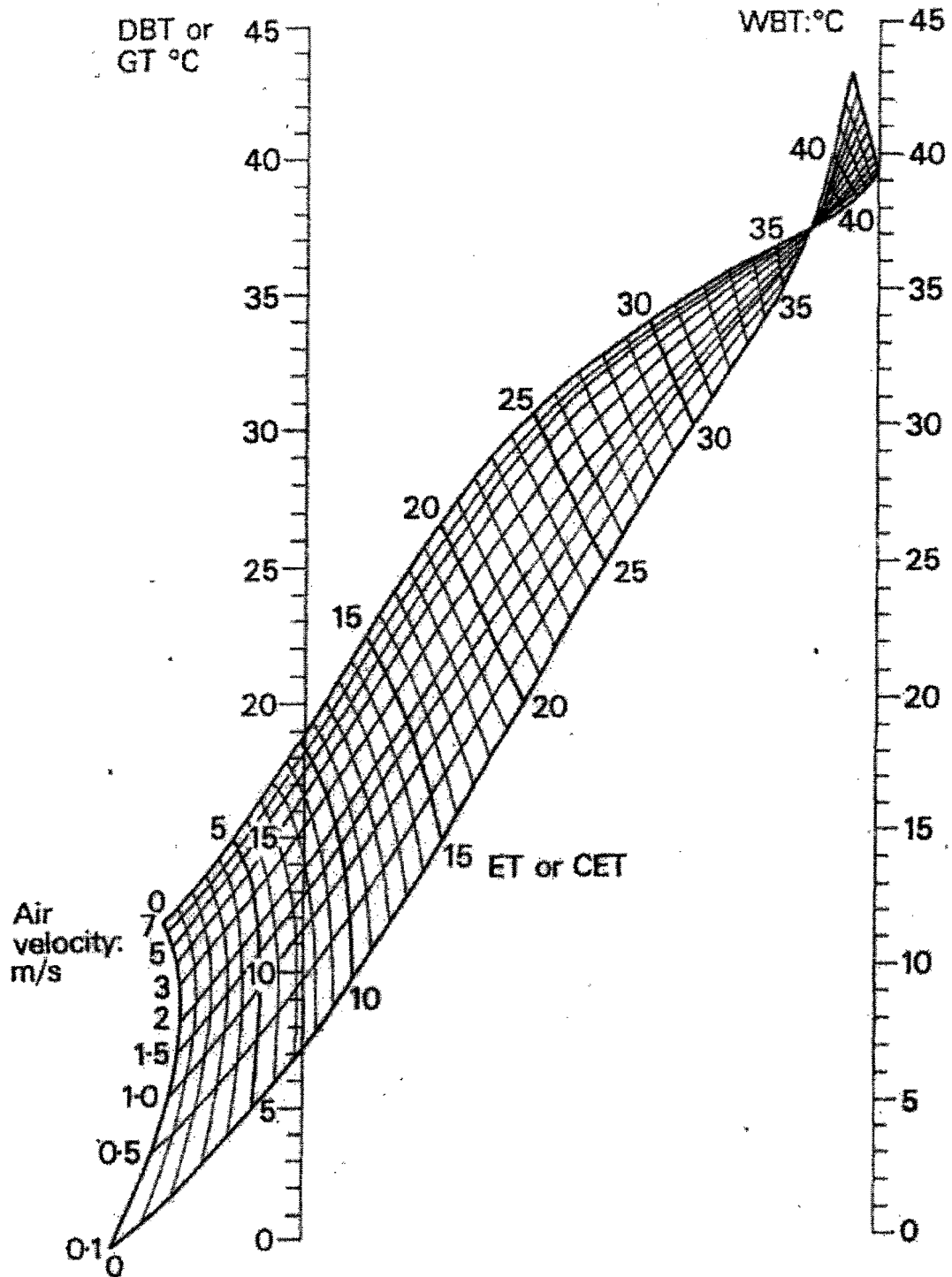


Figure 2 : Corrected Effective Temperature Nomogram



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Rekabentuk Konkrit Bertetulang
(Reinforced Concrete Design)

KNS 3173

Peperiksaan <i>(Examination)</i>	: Final Examination	Tarikh <i>(Date)</i>	: 14 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 a.m – 12.00 noon
Tempat <i>(Place)</i>	: BS 11	Jangkamasa <i>(Duration)</i>	: 3 hours
Pensyarah <i>(Lecturer)</i>	: Prof. Madya Dr. Ng Chee Khoon		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan dari Bahagian A dan jawab mana-mana DUA (2) soalan dari Bahagian B.**
(Answer ALL the questions from Section A and any TWO (2) questions from Section B)
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam kertas jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers using pen only in the answer sheets provided)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbance allowed during the exam)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

SECTION A

Question A1

According to BS 8110: Part 1: 1985, section 3.2.1.2.1, a series of horizontal members connected longitudinally are structurally modeled as

- A. a continuous beam with simple supports
- B. simply-supported beams
- C. beam members rigidly connected to column members
- D. beam-column members

[2 marks]

Question A2

The ultimate design load on an adverse span of a continuous beam for the load case of combined dead and imposed load is

- A. $1.4G_k + 1.6Q_k$
- B. $1.6G_k + 1.4Q_k$
- C. $1.0G_k$
- D. $1.2G_k + 1.2Q_k$

[2 marks]

Question A3

Structural key plans are engineering drawings depicting information on

- I. layout of beams
- II. position of columns
- III. layout of slabs
- IV. position of footings/ foundation

- A. I only
- B. I & II
- C. I, II & III
- D. All of the above

[2 marks]

Question A4

The symbol β_b is used in BS 8110: Part 1: 1985 to denote the ratio of the moment at the section after redistribution to the moment at the section before redistribution and should be less or equal to unity. What is the minimum value of β_b for a structural frame which does not need to provide lateral stability?

- A. 0.3
- B. 0.7
- C. 0.9
- D. 0.1

[2 marks]

Question A5

Of all the BS 8007 recommended modifications to the design requirements of BS 8110 listed below, which recommendation is of most importance with regard to the limit state design?

- A. Use of $\gamma_f = 1.4$ for liquid loads
- B. Maximum crack width limited to 0.2 mm in general and limited to 0.1 mm where aesthetic appearance is critical
- C. At least 75 mm blinding concrete is required below ground slabs
- D. Use of concrete grade 35A

[2 marks]

Question A6

In the design of a gravity type retaining wall, which of the statement(s) listed below is/ are not true?

- I. It must be checked for stability against sliding
- II. It must be checked for stability against overturning
- III. The resultant force of the horizontal force and self-weight must be within the middle one-third of the base width
- IV. It must be design for shear and bending at the critical sections

- A. III & IV
- B. I & II
- C. IV only
- D. I, II & III

[2 marks]

Question A7

What is the characteristic load in structural concrete design?

- | | |
|---|---|
| A. The unfactored load | C. The factored dead load at ultimate limit state |
| B. The factored live load at ultimate limit state | D. The factored wind load at ultimate limit state |

[2 marks]

Question A8

In the design of a staircase, the allowable span-to-depth ratio is allowed to be increased by 15% according to BS 8110. Under which circumstances that this increase is allowed?

- | | |
|---|--|
| A. The live load is larger than the dead load | C. The stair flight occupies at least 60 percent of the span |
| B. The span is less than 6 m | D. The stair flight occupies the whole span |

[2 marks]

Question A9

In the design of retaining walls, stability of the walls is checked at

- | | |
|-------------------------------|-------------------------|
| A. ultimate limit state | C. all the limit states |
| B. serviceability limit state | D. special limit state |

[2 marks]

Question A10

In the design of a water retaining structure, which of the following is the most important part in ensuring the water-tightness of the structure?

- | | |
|------------------------|----------------------|
| A. Compressible filler | C. Blinding concrete |
| B. Sealer | D. Surface waterbar |

[2 marks]

Question A11

A part of a typical floor key plan for a building structure is shown in Fig. Q-A11. The floor has a clear space with brick walls at the outer perimeter only and the slabs are 150 mm thick without any finishes. The live load on the slabs is 3 kN/m^2 and specific weight of concrete is 24 kN/m^3 .

- (a) Calculate and show the service loads on the analysis model for beam 4/A-B-C-D. The calculation of each load must be clearly presented.

[10 marks]

- (b) Calculate the service loads on column 4/B for this floor only. The calculation of each load must be clearly presented.

[10 marks]

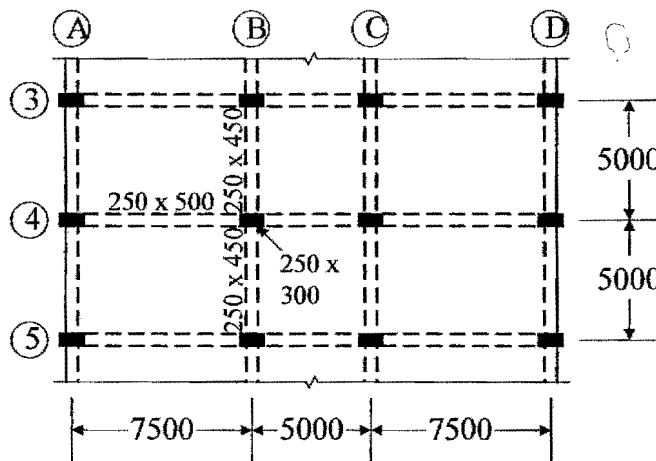


Fig. Q-A11

SECTION B**Question B1**

Fig.Q-B1 shows the side elevation of a staircase supporting a live load of 3.5 kN/m^2 . The staircase is finished with materials of 1.0 kN/m^2 . The characteristic material strengths are $f_{cu} = 30 \text{ N/mm}^2$ and $f_y = 460 \text{ N/mm}^2$, and density of concrete is 24 kN/m^3 . Design the longitudinal reinforcement for the staircase and check for shear resistance, deflection and crack control. Provide a sketch of the reinforcement details for the final design. Consider the possible increase in allowable span-to-depth ratio of 15% for stair flight occupying at least 60% of the span in estimating the staircase thickness. Use a concrete cover of 25 mm for the staircase.

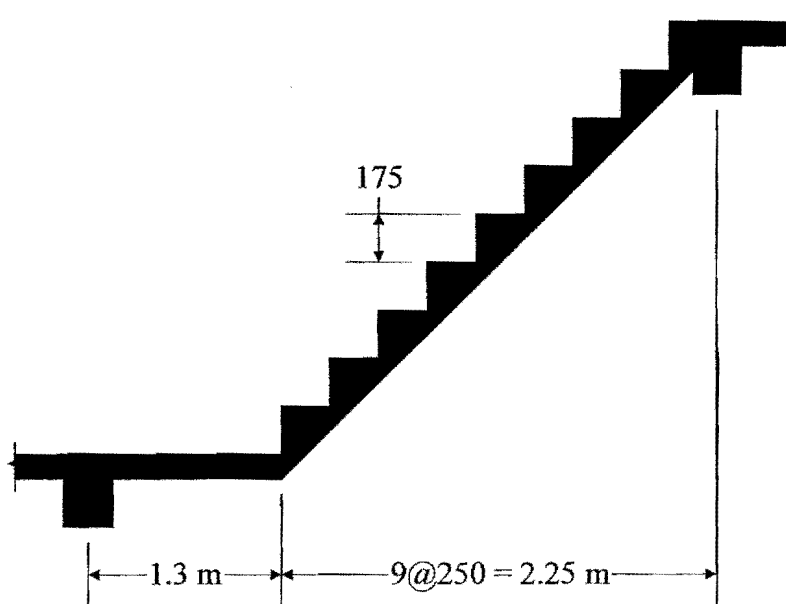
[30 marks]

Fig. Q-B1

Question B2

Fig. Q-B2 shows the front elevation of a 6-storey reinforced concrete building frame which is to be built without bracing for lateral loading. The actual height of the ground floor columns is 5.0 m whereas the actual height of columns in the other floors is 3.4 m. All the columns have a cross section of 300 mm \times 300 mm, whereas all the beams have effective spans of 6 m, 4 m and 6 m respectively, with cross section of 250 mm \times 500 mm. Other than the vertical loads, the structural frame is also subjected to a characteristic (unfactored) wind load of 4.0 kN/m within the full height of the building. Based on BS8110: Part 1: 1985, section 3.2.1.3.2 (b), analyse and indicate the axial forces in columns and shear forces in beams and columns for the upper 3 floors of the structure subjected to the factored lateral load only. (Assume that the ground floor column and footing joints are fixed.)

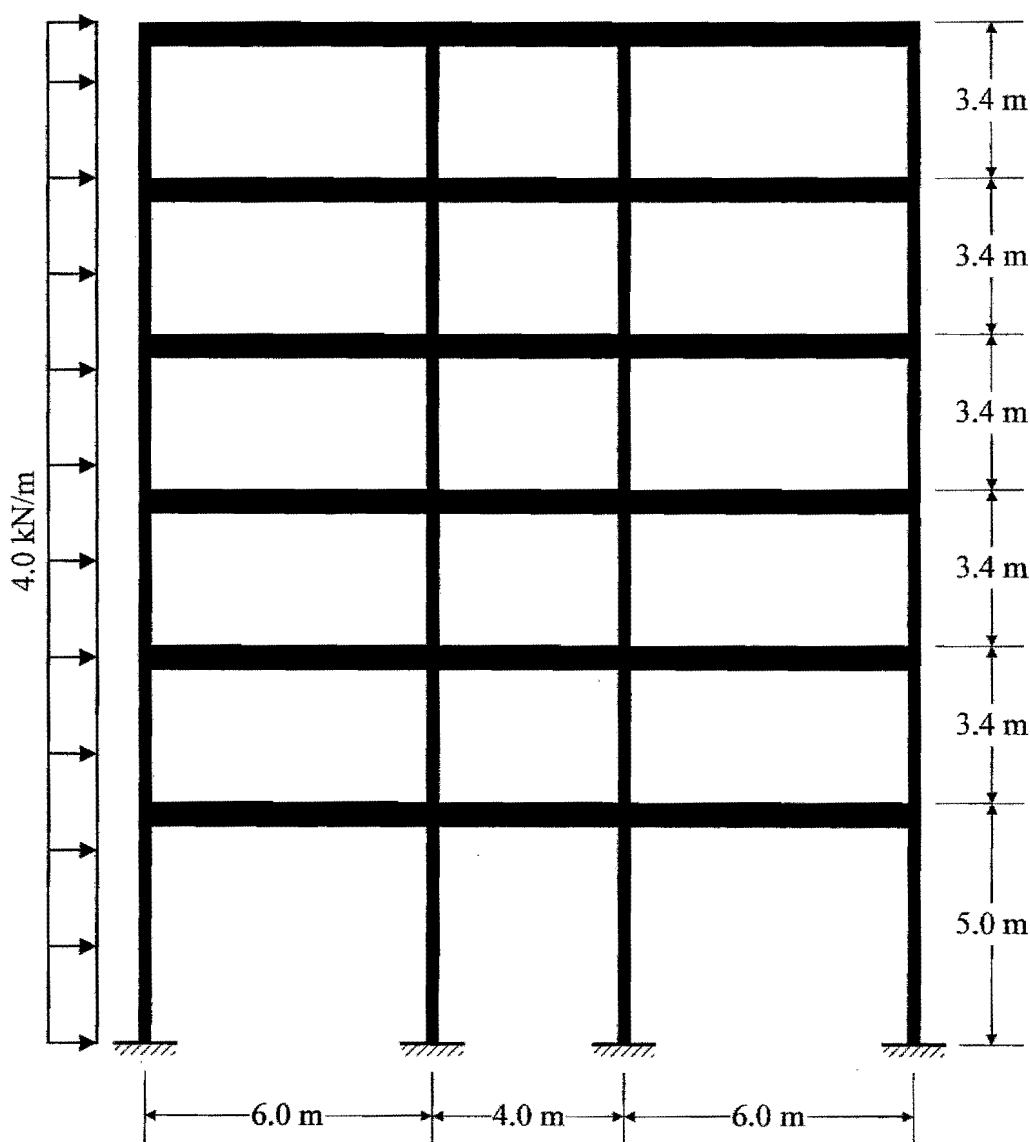
[30 marks]

Fig. Q-B2

Question B3

A construction site consists of a backfill 5.0 m above existing ground level. In order to ensure the stability of the backfill, a cantilever retaining wall is required as shown in Fig. Q-B3. For a preliminary calculation, the following data may be used:

Surcharge load behind the retaining wall	=	10 kN/m ²
Density of soil, γ	=	19 kN/m ³
Internal friction angle, ϕ	=	35°
Allowable bearing pressure	=	150 kN/m ²
Coefficient of friction, μ	=	0.5
Neglect soil cohesion, c	=	0

For the proposed retaining wall, check the stability for sliding, overturning and settlement. After that, design for all the reinforcement required and check for shear and crack control. The characteristic material strengths are $f_{cu} = 30 \text{ N/mm}^2$ and $f_y = 460 \text{ N/mm}^2$, and density of concrete is 24 kN/m^3 . Use concrete cover of 50 mm to the main reinforcement.

[30 marks]

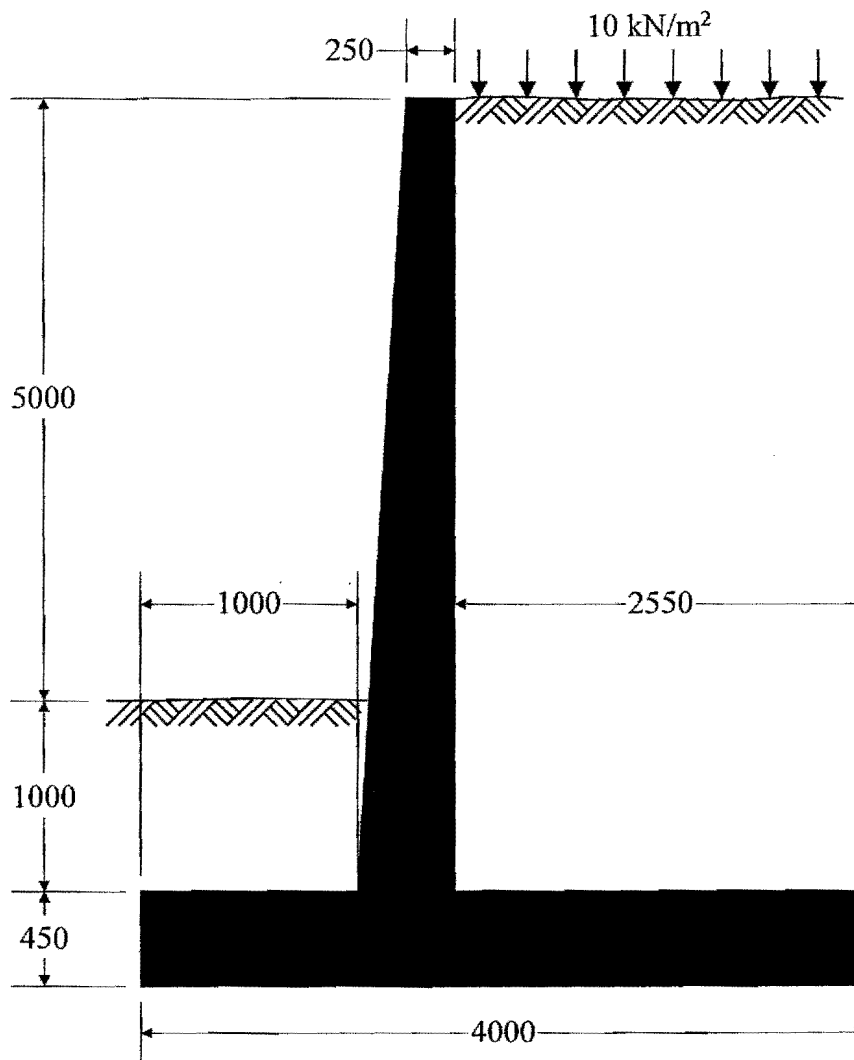


Fig. Q-B3



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Engineering Management
(Pengurusan Kejuruteraan)

KNS 1472

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 14 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 4.00 pm
Tempat <i>(Place)</i>	: Dewan Kuliah 1	Jangkamasa <i>(Duration)</i>	: 2 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Siti Halipah Haji Ibrahim/ Mdm. Ting Sim Nee		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer any ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

- a. Name **four** types of sectors involved in construction. [4 marks]
- b. What is the role of civil engineer during the construction stage? [6 marks]

Question 2

Describe with the aid of simple sketches the organization of the individual proprietorships and partnership [15 marks]

Question 3

What are the criteria for consideration of contractors practice in Malaysia. [5 marks]

Question 4

- a. Give **two** types of contract? [2 marks]
- b. What is the content of contract document? [8 marks]

Question 5

- a. Name the principal objectives of engineering management [2 marks]
- b. Explain the relationship among these objectives [8 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Tapak
(Foundation Engineering)

KNS 3243

Peperiksaan (Examination)	: Akhir	Tarikh (Date)	: 15 November 2005
Semester	: 1 Sesi 2005/2006	Masa (Time)	: 9.00 am – 12.00 pm
Tempat (Place)	: Bilik Seminar 9	Jangkamasa (Duration)	: 3 jam
Pensyarah (Lecturer)	: Dr Vishwas A Sawant		

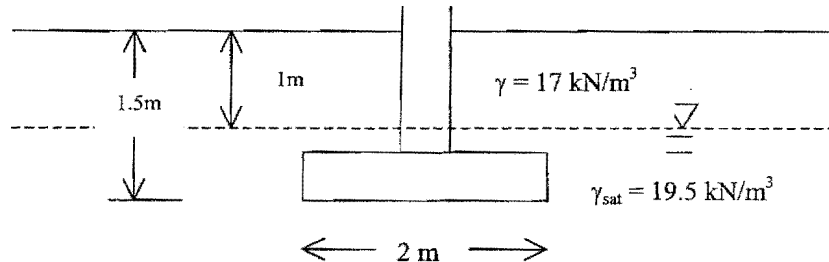
- Arahan**
(Instruction)
1. Pelajar perlu menjawab 6 soalan kesemuanya. Solan 1 dan 2 adalah wajib. Pilih 4 soalan dari 3 hingga 7.
(Student must answer SIX Questions. Questions 1 and 2 are compulsory. Select any FOUR from questions 3 to 7).
 2. Baca soalan dengan teliti sebelum menjawab.
(Read the questions carefully before answering).
 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.
(Write the answers only in the answer books provided using only pen).
 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.
(No talking or disturbing other candidates during the duration of test).
 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

- a. A column foundation is shown in Figure. Determine the net allowable load using Meyerhof theory. [12 marks]

$$D = 1.5 \quad D_w = 1 \quad B = 2 \quad L = 3 \quad (\text{All in m})$$

$$c = 70 \text{ kN/m}^2 \quad \gamma = 17 \text{ kN/m}^3 \quad \text{and} \quad \gamma_{\text{sat}} = 19.5 \text{ kN/m}^3$$



- b. What is the effect of local shear failure and water table on bearing capacity? [08 marks]

Question 2

- a. A natural loessial soil deposit has a dry unit weight of 13.2 kN/m^3 . The liquid limit of soil is 31 and $G = 2.64$. Is collapse likely to occur in this soil? [03 marks]

- b. An expansive soil has an active zone thickness of 8m. Natural moisture content of soil is 20%, and its liquid limit is 55. Calculate the free surface swell of the expansive soil upon saturation. [04 marks]

$$w_L = 50 \rightarrow s_w = 3 \quad \text{and} \quad w_L = 60 \rightarrow s_w = 6$$

- c. An expansive soil profile, has an active zone thickness of 5.2m. A shallow foundation is to be constructed at 1.2 m below ground surface. A swelling pressure test provided the following data. [08 marks]

Depth below ground surface (m)	Swell under over burden and estimated foundation surcharge pressure, s_w %
1.2	3.00
2.2	2.00
3.2	1.20
4.2	0.55
5.2	0.00

Estimate the possible swell under the foundation. If allowable swell is 15 mm, what would be necessary under cut?

- d. Write a note on settlement of sanitary landfills. [05 marks]

Question 3

- a. Explain cone penetration test in detail. [07 marks]
- b. A 7m deep braced cut in sand is supported by three struts at depth 1m, 3m and 5m. In plan struts are placed at 3m c/c spacing. Calculate the design strut load. Density of sand is 16 kN/m^3 and Angle of internal friction is $\phi = 30^\circ$. [08 marks]

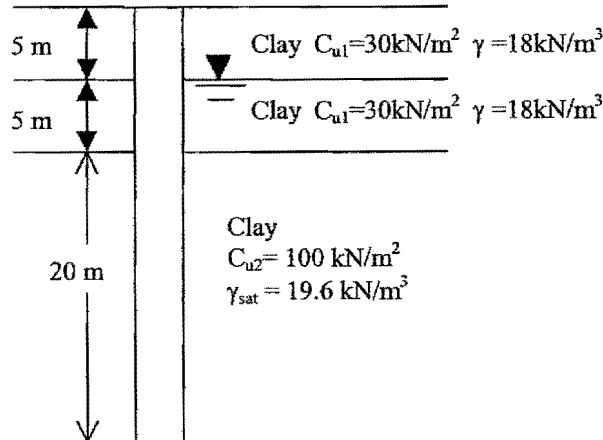
Question 4

A driven pile in clay is shown in Figure. The pile has a diameter of 406mm. [15 marks]

Calculate the net point bearing capacity.

Calculate skin resistance by α -Method, β -Method, and λ -Method. For all clay layers $\phi_R = 30^\circ$. The top 10m is normally consolidated clay. The bottom clay layer has an OCR of 2. Estimate the net allowable pile capacity with FS=4.

(For $c_u = 30$, $\alpha = 1$, and $c_u = 100$, $\alpha = 0.5$, and $\lambda = 0.14$)



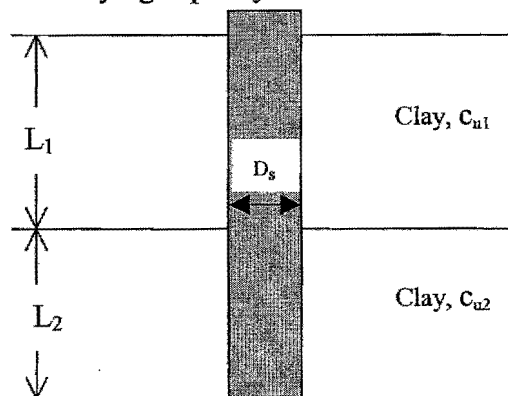
Question 5

A drilled shaft in cohesive soil is shown in figure. Use Reese & O'Neill Method to determine ultimate load carrying capacity. [15 marks]

$$L_1 = 6 \text{ m} \quad c_{u1} = 45 \text{ kN/m}^2$$

$$L_2 = 5 \text{ m} \quad c_{u2} = 74 \text{ kN/m}^2$$

$$D_s = 1.5 \text{ m}$$



Question 6

- Derive expression for a foundation system with stiffness k , mass m , and damping c , subjected to a sinusoidal load $F_0 \sin \omega t$. [10 marks]
- Using Barken's expression for natural frequency and amplitude of vibration, calculate the change in percentage amplitudes in terms of frequency ratio r , if the soil mass participating in vibrations is 23% of m . Also calculate the change for $r = 0.3$ and $r = 2$. [5 marks]

Question 7

Find the maximum base pressure and lateral load per unit length of the well base, for a well shown in Figure. The following data are given.

[15 marks]

Effective downward force on well,
including self weight $W = 1000 \text{ t}$

Height of point of application of horizontal
force above the scour line $H = 9 \text{ m}$

Depth of well below scour line $D = 9 \text{ m}$

Submerged unit weight of soil

$$\gamma = 0.78 \text{ t/m}^3$$

Angle of internal friction $\phi = 30^\circ$

Coefficient of vertical subgrade reaction

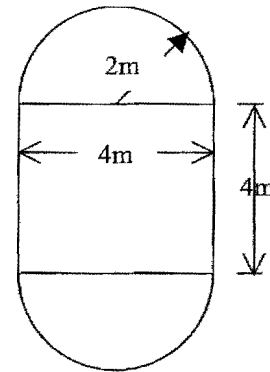
$$k = 2500 \text{ t/m}^3$$

Coefficient of friction $\mu = 0.5$

Safe bearing capacity of soil at the base of well $= 45 \text{ t/m}^2$

Horizontal displacement of the well cap $= 2 \text{ cm}$.

Assume that the well rotates about its base.

**Formulae****Bearing Capacity Factors**

$$N_q = \tan^2\left(45 + \frac{\phi}{2}\right) e^{\pi \tan \phi}$$

$$N_c = (N_q - 1) \cot \phi$$

$$N_\gamma = (N_q - 1) \tan(1.4\phi)$$

Shape Factors

$$s_c = 1 + 0.2K_p \frac{B}{L}$$

$$s_q = s_\gamma = 1 + 0.1K_p \frac{B}{L}$$

Depth Factors

$$d_c = 1 + 0.2\sqrt{K_p} \frac{D}{B}$$

$$d_q = d_\gamma = 1 + 0.1\sqrt{K_p} \frac{D}{B}$$

$$f = \beta \sigma'_v$$

$$\beta = k_o \tan \phi_R = (1 - \sin \phi_R) \tan \phi_R$$

$$\beta = k_o \tan \phi_R = (1 - \sin \phi_R) \sqrt{OCR} \tan \phi_R$$

$$f_{av} = \lambda(\bar{\sigma}'_v + 2c_u)$$

$$q_p = 6c_u \left(1 + 0.2 \frac{L}{D_b}\right) < 9c_u$$

$$p_a = 0.65 k \gamma H$$

$$P_1 = \frac{\gamma(K_p - K_a)}{6} D^2$$

$$M_1 = \frac{\gamma(K_p - K_a)}{12} D^3$$

$$M_3 = \frac{\gamma(K_p - K_a)}{12D} B^3 \frac{k}{m}$$

$$W = \mu P_1 L + R_1$$

$$p_t = \frac{R_1}{A} + \frac{M_B}{Z}; \quad p_h = \frac{R_1}{A} - \frac{M_B}{Z}$$

$$M_3 = \frac{(p_t - p_h)}{12} B^2$$

$$PL = P_1 L - F_1$$

$$PLH = M_B - M_1 L + F_1 D + \mu P_1 \frac{B_0}{2} L$$

$$\omega_n = \sqrt{\frac{c_u A}{m}}; \quad z_{max} = \frac{z_{st}}{(1 - r^2)}$$

$$\gamma_d \leq \frac{G\gamma_w}{1 + w_L G}$$

$$\Delta S_F = 0.0033 z s_w$$

$$\Delta S = \sum \frac{s_{wt} H_i}{100}$$



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Mekanik Bendalir
(Fluid Mechanics)

KNS 2113

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 14 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 11 & 12	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Prof. Salim Said		

- Arahan**
(Instruction)
- 1. Jawab mana-mana LIMA (5) soalan sahaja.**
(Answer any FIVE (5) questions only).
 - 2. Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 - 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 - 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 - 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

A sluice gate is installed across a channel of 2 m wide (Fig. 1). When the gate is closed, water builds up behind the gate to 1.6 m high. Determine the magnitude of the horizontal component of the anchoring force required to hold the gate in place.

[9 marks]

With the gate open, the depth of water beyond the gate is 1.0 m and flowing at velocity 1.2 m/s. Assume that the depth of water behind the gate remains the same. Determine the magnitude of the horizontal reaction force to hold the gate in place.

[9 marks]

Is the anchoring force required to hold the gate in place larger when the gate is closed or when it is open?

[2 marks]

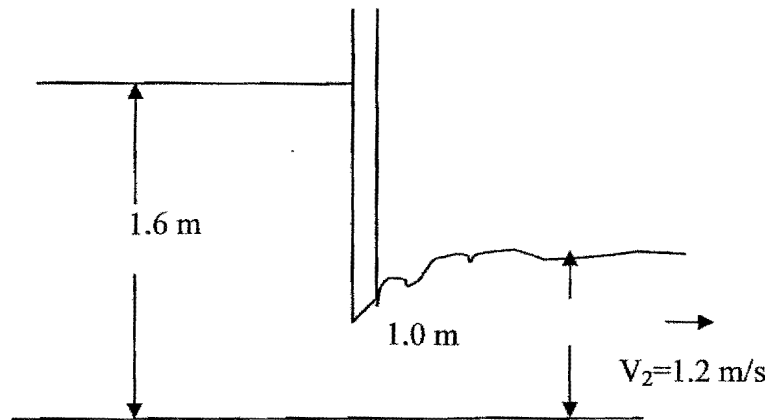


Fig. 1

Question 2

A fluid flows at a velocity V through a horizontal pipe of diameter D . An orifice plate containing a hole of diameter d is placed in the pipe. It is desired to investigate the pressure drop, Δp , across the plate. Determine a suitable set of π terms to study this problem experimentally. Assume that the pressure drop is a function of D , d , V and, ρ the fluid density.

[20 marks]

Question 3

A rectangular sharp-crested weir is used to measure the flowrate in a small stream. Derive an expression for the flowrate measurement.

[10 marks]

What is the flowrate if the head H , of the water above the crest of the weir is 0.3 m and width of the crest is 2.0 m? Assume the discharge coefficient $C_1 = 1$.

[10 marks]

Question 4

A homogeneous, 1.6-m wide and 2.4-m long rectangular gate weighing 10 kN is held in place by a horizontal flexible cable as shown in Fig. 2. [20 marks]
Water acts against the gate, which is hinged at point A. Friction in the hinge is negligible. Determine the tension in the cable.

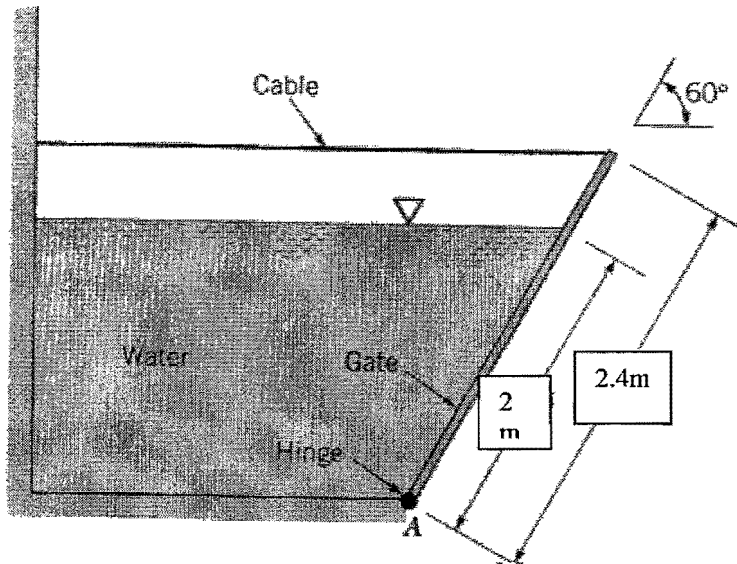


Fig. 2

Note: Geometric properties of the gate are:

a = length of gate

b = width of gate

$$I_{xc} = (1/12)ba^3$$

$$I_{yc} = (1/12)ab^3$$

$$I_{xyc} = 0$$

Question 5

A venturi meter, consisting of an inlet portion (section 1), a converging portion followed by a throat portion of constant diameter (section 2) and then a gradually diverging portion, is used to determine the flowrate in a pipe. The diameter at section 1 is 10 cm, and at the throat is 5 cm. Find the discharge through the pipe when the pressure difference $(p_1 - p_2)/\gamma = 12$ cm. Water is the flowing fluid. [20 marks]

Question 6

Determine the rate at which the water level rises in an open container if the water coming in through a 0.20-m^2 (area of cross-section) pipe has a velocity of 0.5 m/s and the flow rate going out is $0.15\text{ m}^3/\text{s}$. The container has a circular cross section with a diameter, $D = 3.0\text{ m}$. (Fig. 3). Assume initial depth = 2 m . **[15 marks]**

What is the depth of water after 2 min ? **[5 marks]**

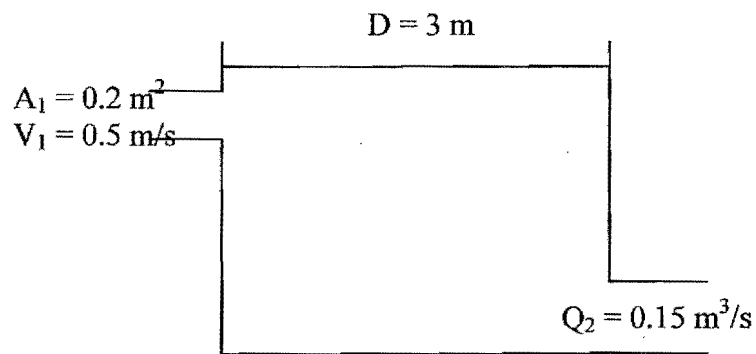


Fig. 3



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

PENGURUSAN PROJECT
(PROJECT MANAGEMENT)

KNS 3203

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 16 th November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: BS 11	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Mdm Ting Sim Nee		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer any ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1:

a. List out the components of a typical engineering project life cycle. Describe each component briefly in terms of the major activities carried out in each component.

(15 marks)

b. Time Cost Quality and Safety is the principal of objectives of project management. However, sometimes project team cannot achieve all four and have to give up certain one/s. Describe the tradeoffs between these objectives.

(15 marks)

Total for Question 1: 30 marks

Question 2:

a. What are the components of direct cost in civil engineering cost estimations?

(5 marks)

b. What is the difference between estimates and budgets?

(6 marks)

c. Describe how one can use proper work breakdown analysis when planning for cost in any project.

(12 marks)

d. What is Quality Assurance and why is it important to provide Quality Assurance to client in construction?

(12 marks)

Total for Question 2: 35 marks

Question 3:

a. What are the two main purposes of doing critical path analysis rather than normally Gantt chart?

(8 marks)

b. The following are the activities pertaining to a construction of a simple low cost housing unit. Given the network diagram, determine the following:

- Earliest start and earliest finish (10 marks)
- Latest start and latest finish (10 marks)
- Critical path for the project (2 marks)

Item	Activity	Duration (days)
1	Piles casting	5
2	Drive Piles	3
3	Order Forms	8
4	Order Steel bars	10
5	Construct Forms	7
6	Placing of bars	10
7	Mix Concrete	10
8	Pouring and Compacting	18
9	Strip Forms	5

Network diagram is attached with this question.

Total for Question 3: 30 marks

Question 4:

- a. List out some of the potential risks in engineering project during construction. (5 marks)
- b. Why is it important for project manager to do risk analysis before committing into a project? (5 marks)
- c. Describe how a project manager can carry out risk analysis. (15 marks)

Total for Question 4: 25 marks

Question 5:

- a. Part of Conceptual stage is doing appraisals. Economic appraisal constitutes a large part of decision making. What is an Economic appraisal?
(5 marks)
- b. What are the fundamental elements an economic appraisal seeks to appraise? What is the difference between CBA and CEA?
(5 marks)
- c. Identify and very briefly describe the steps taken in preparing an economic appraisal.
(15 marks)

Total for Question 5: 25 marks

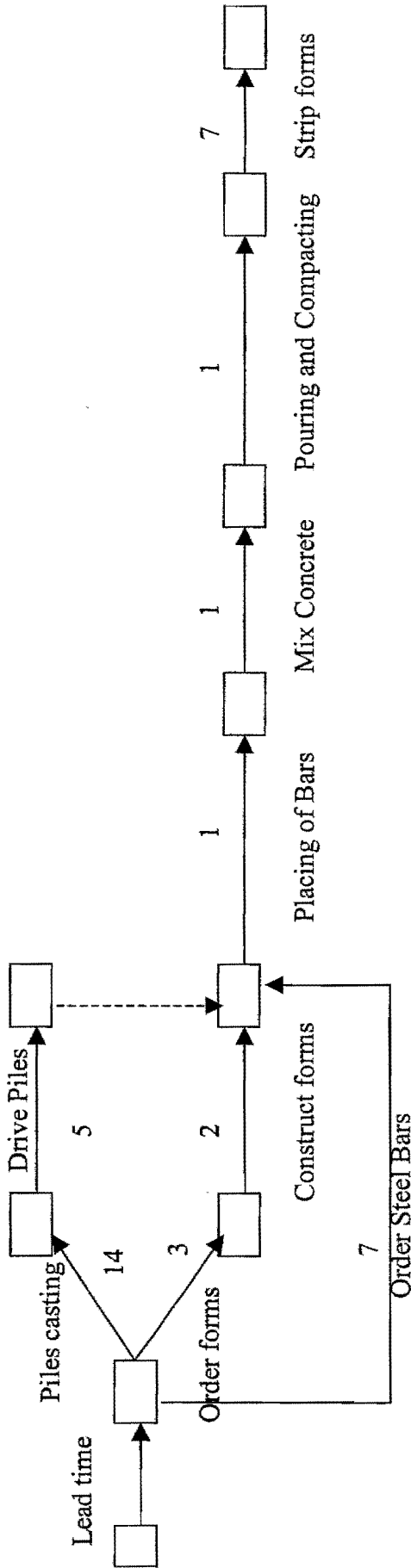
Question 6:

- a. Define the following terms in engineering law:
• What is an offer?
• What is an acceptance?
• What is a counter offer?
You can use example to describe the above.
(6 marks)
- b. In the event of delay, what are the duties and responsibilities of the parties in the contract?
(10 marks)
- c. When claiming for an interim payment, what are the duties and responsibilities of the parties in the contract?
(10 marks)
- d. Describe arbitration as one of the dispute settlements method. In your opinion is it effective.
(9 marks)

Total for Question 6: 35 marks

Question 3:

Network Diagram from 2nd Level Work Breakdown analysis for Construction of Footings



Please use this sheet to answer Question 3. Student can detached this sheet and hand in with his/her solution books.



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Lebuhraya dan Pengangkutan
(Highway and Transportation Engineering)

KNS3183

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 17 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 12.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 12	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: En. Mohamad Raduan bin Kabit		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer any ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1 (20marks)

- a. Explain the objective of route selection in the highway construction in [3 marks]
particularly related to the earthwork computation.
- b. Explain, define and distinguish the terms of shrinkage and swelling in the [5 marks]
earthworks
- c. Given the end areas below, calculate the volumes of cut and fill between [12 marks]
stations 351+00 and 352+50. If the material swells 10 percents, how
much excess cut or fill is there? Express cut in m³ of cut, and excess fill
in m³ of fill.

Station	End areas m ²			Volume m ³		
	Cut		fill	Cut		fill
351+00			57.93			
351+50			52.28			
351+75	5.25		23.58			
352+00	8.40		3.73			
352+14	13.80		5.25			
352+50	33.34					
			TOTAL=			

Question 2 (30 marks)

- a. Define and explain how the following factors are relevant in the [8 marks]
geometric design of rural roads
- i) Design Speed
 - ii) Traffic volume
 - iii) Visibility
 - iv) Superelevation
- b. In a highway design, you are normally required to determine the [5 marks]
classification the road and its Right of Way". Clearly define and provide
an appropriate illustration to justify your answer.
- c. A 150 m equal tangent crest-vertical curve has the PVC at station 8+500 [10 marks]
and elevation of 250 m. The initial grade is +2.6% and the final grade is -
0.5%. Determine the elevation and stationing of the PVI, PVT and the
highest point of the curve.
- d. A horizontal curve has an angle of intersection (external angle , [7 marks]
deflection angle) of 37 ° and radius 550 m. the station PC is 10 + 22.31.

Calculate the following :

- a. Length of Curve
- b. Tangent Distance
- c. Middle Ordinate Distance
- d. Length of Chord
- e. External Distance
- f. Station PI
- g. Station PT

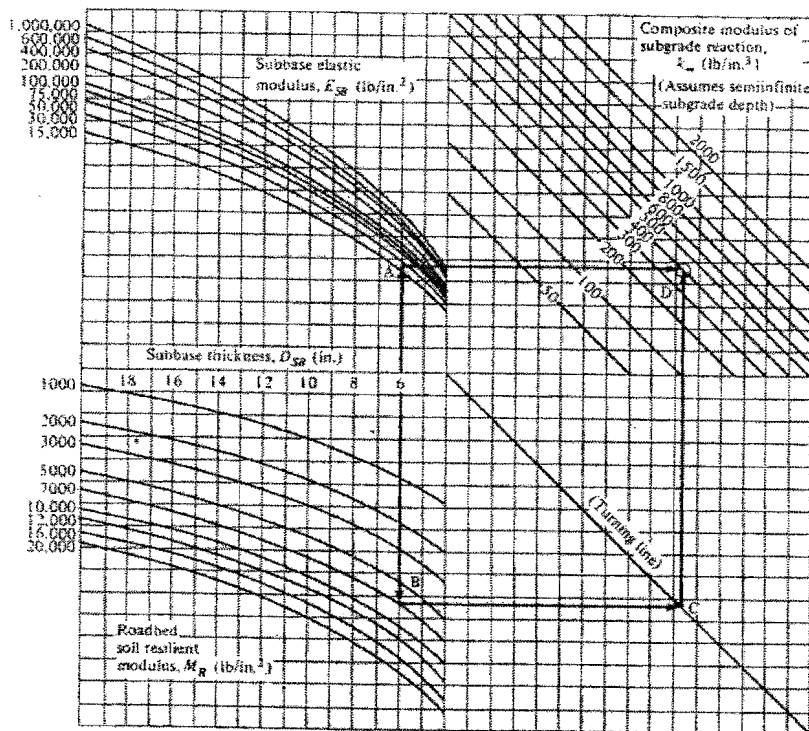
Question 3 (30 marks)

- a. What is the term “asphalt concrete” refers to? Briefly discuss about the material compositions and its common types which are used in pavement construction. [3 marks]
- b. List five (5) variables, with the appropriate measurement units (if any), which are required in estimating the structural number (SN) of a layer in the AASHTO pavement design chart. [2 marks]
- c. In the AASHTO pavement design method, state what the term “reliability” is intended to address in pavement design. What two numerically specified variables are used to describe reliability, and what typical ranges of these values might be appropriate for a high volume freeway in and urban area? [3 marks]
- d. An *interstate highway* pavement composed of HMA surface course, a *cement treated- base course*, and a sand gravel subbase is to be designed for W_{18} of 0.12×10^7 . Water can be removed from the subbase *within a week*. However, due to the large amount of precipitation, *more than 25 %* of the time the pavement will be exposed to moisture levels approaching saturation. The material properties are summarized below : [15 marks]
 - Effective roadbed soil resilient modulus = 5500 psi
 - Unconfined compressive strength of cement-treated base at 7 days = 350 psi
 - Resilient modulus of HMA = 4.3×10^5 psi

If *The structural layer coefficient for subbase (a_3) is 0.075*.
Determine the thicknesses of the surface, base, subbase courses required.

- e. Given a subbase thickness D_{SB} of 8 in , a subbase resilient modulus E_{SB} of 200,000 psi, and roadbed soil resilient modulus M_R of 16,000 psi, determine the composite modulus of subgrade reaction k_{oo} . [7 marks]

The composite modulus of subgrade reaction can be determined as follows :



Example:

$$D_{sb} = 6 \text{ in.}$$

$$E_{sb} = 20,000 \text{ lb/in.}^2$$

$$M_R = 7,000 \text{ lb/in.}^2$$

$$\text{Solution: } k_a = 400 \text{ lb/in.}^2$$

Question 4 (20 marks)

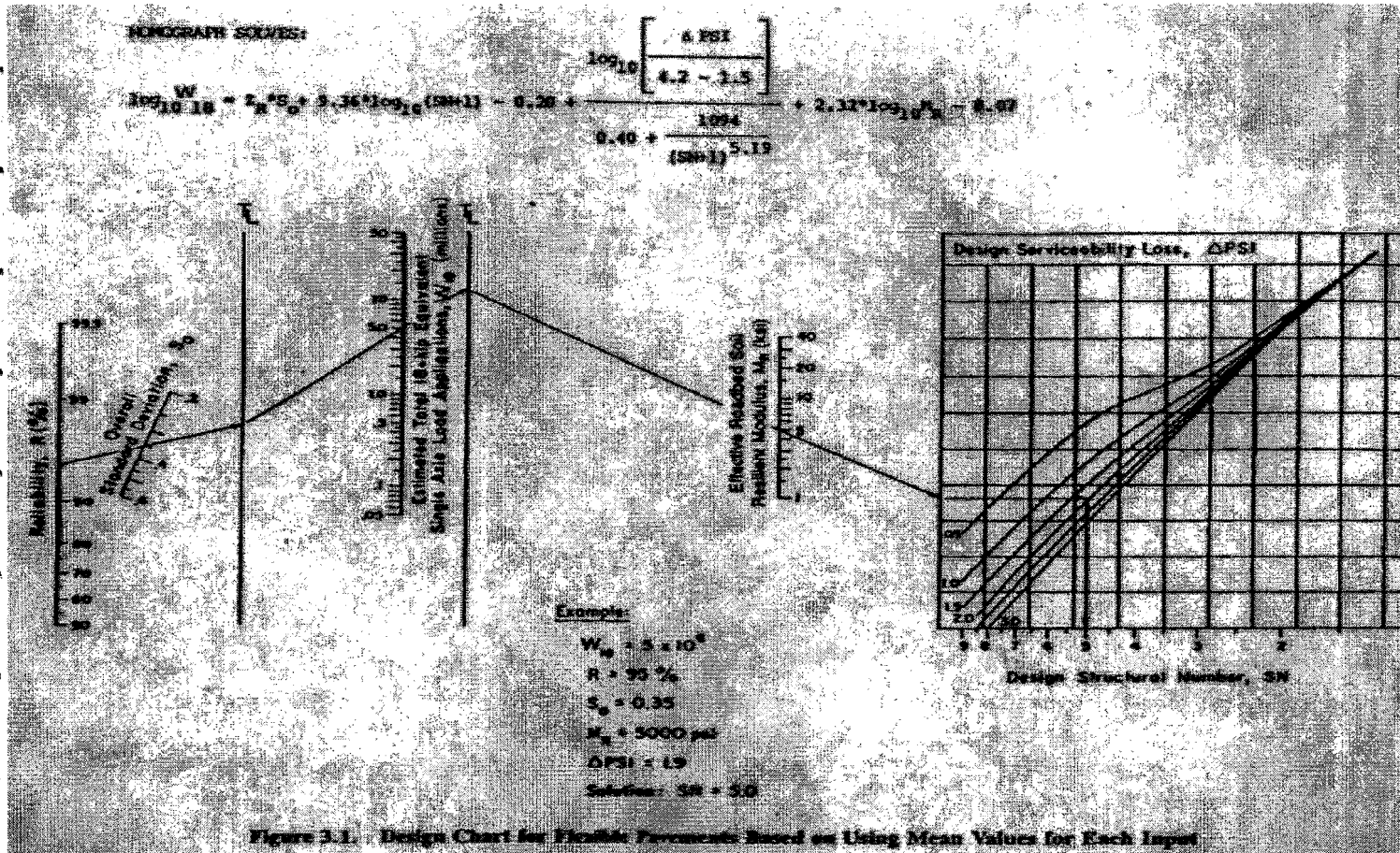
- Give four (4) main functions of highway drainage and clearly state the classification of the drainage based on the functions given. [5marks]
- Describe the steps involved in calculating the surface runoff (Q) and explain why you need to get the local knowledge/sources for the design input. [7 marks]
- For the open channel design, state clearly the formula used to compute the velocity and also describe the all the terms in the formula. [4 marks]
- With a clear and proper illustration, describe the following traffic flow conditions at the following intersections: [4 marks]
 - simple T- junction
 - staggered T- junction
 - Crossroads junction
 - Roundabout intersections (normal roundabout with four arms)

(If the major road is having 7500 AADT and 2000 AADT for the minor road, describe the flow at each of the intersections above.)

Appendices

Appendix A

Helping Chart and formula



Giving :

$$D_1^* = \frac{SN_1}{a_1}$$

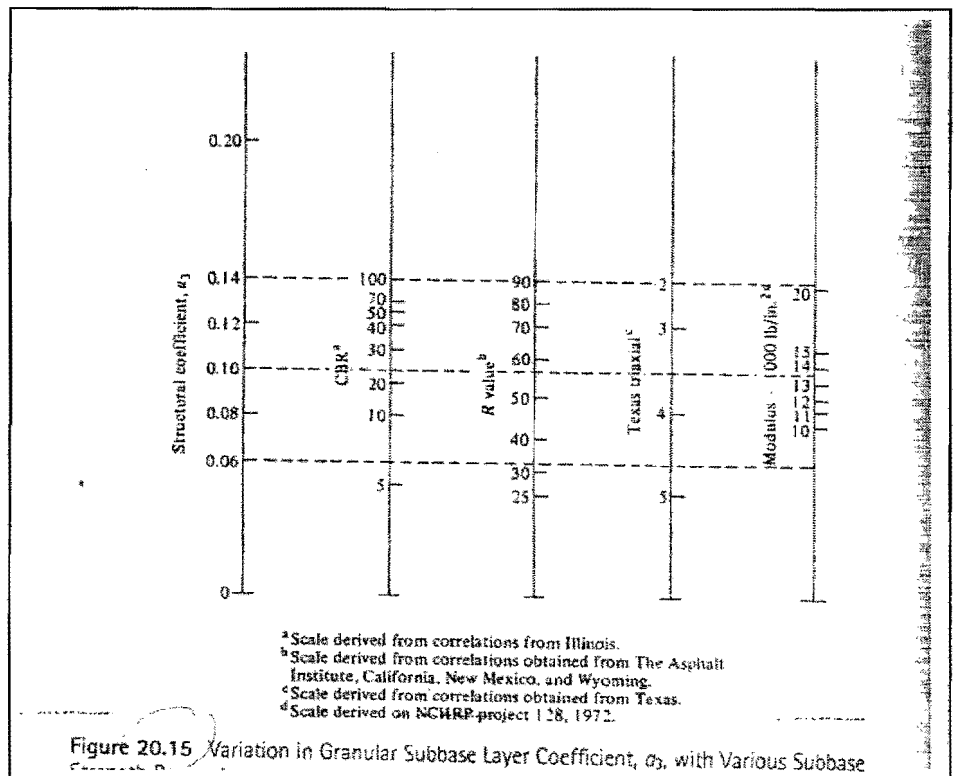
$$SN_1^* = a_1 D_1^*$$

$$D_2^* \geq \frac{SN_2 - SN_1^*}{a_2 m_2}$$

$$SN_2^* = a_2 D_2^* m_2 + SN_1^*$$

$$D_3^* = \frac{SN_3 - SN_2^*}{a_3 m_3}$$

$$SN_3^* = a_3 D_3^* m_3 + SN_2^*$$



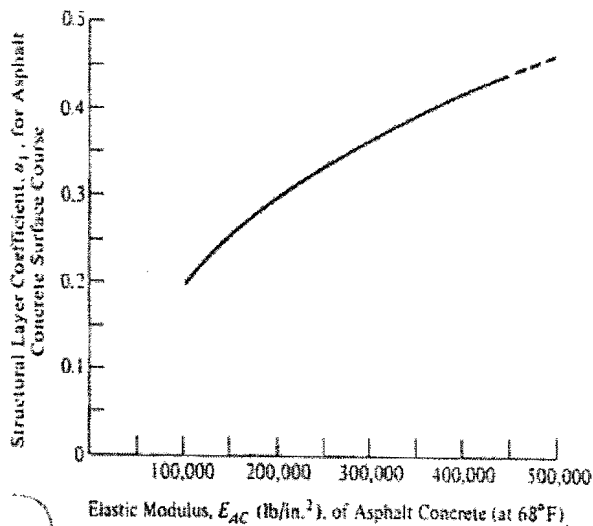


Table 2.4. Recommended m_1 Values for Modifying Structural Layer Coefficients of Untreated Base and Subbase Materials in Flexible Pavements

Quality of Drainage	Percent of Time Pavement Structure is Exposed to Moisture Levels Approaching Saturation			
	Less Than 1%	1-5%	6-25%	Greater Than 25%
Excellent	1.40-1.35	1.35-1.30	1.30-1.20	1.20
Good	1.35-1.25	1.25-1.15	1.15-1.00	1.00
Fair	1.25-1.15	1.15-1.05	1.00-0.80	0.80
Poor	1.15-1.05	1.05-0.90	0.80-0.60	0.60
Very poor	1.05-0.95	0.95-0.75	0.75-0.60	0.60

Table 2.3. Definition of drainage quality

Quality of Drainage	Water Removed Within*
Excellent	2 hours
Good	1 day
Fair	1 week
Poor	1 month
Very poor	(Water will not drain)

* Time required to drain the base layer to 50% saturation

Recommended level of Reliability

Functional Classification	Urban	Rural
Interstate and other freeways	85-99.9	80-99.9
Other principal arterials	80-99	75-95
Collectors	80-95	75-95
Local	50-80	50-80

correlation chart for estimating M_R of bases

Standard Deviation, S_o

Flexible Pavement	0.40 - 0.50
Rigid pavement	0.30 - 0.40

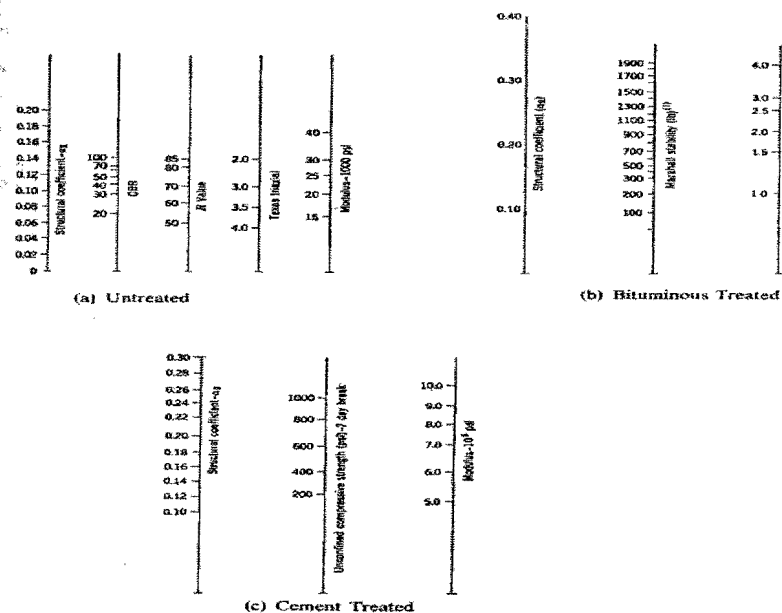


Figure 7.15 Correlation charts for estimating resilient modulus of bases (1 lb = 4.45 KN, 1 psi = 6.9 kPa). (After Van Til et al. (1972).)

Appendix B**Formula :****Vertical alignment**

- **Elevation** = $y = ax^2 + bx + c$
- $A = (G_2 - G_1) / 2 L$
- **Stopping Sight Distance (SSD)**

$$SSD = 0.278 (t) (V) + \frac{V^2}{254 (f \pm G)}$$

- **Length of Curve (crest)**

If $S < L$

$$L = AS^2 / (200 (\sqrt{H_1} + \sqrt{H_2}))^2$$

If $S > L$

$$L = 2S - \frac{(200 (\sqrt{H_1} + \sqrt{H_2}))^2}{A}$$

- **Length of Curve (Sag)**

If $S < L$

$$L = 2S \frac{200 (H + S \tan \beta)}{A}$$

If $S > L$

$$L = 2 * 90.57 \frac{AS^2}{200 (H + S \tan \beta)}$$

- **The minimum length for comfort criterion**

$$L = A (U)^2 / 390$$

- **The minimum length for appearance criterion**

$$L = 30.48 A$$

- **R min** = $V^2 / 127 (e + f)$

Horizontal Alignment:**When $S < L$**

$$M = R (1 - \cos (28.65 S/R))$$

When $S > L$

$$M = R (1 - \cos (28.65 S/R) + (S-L)/2 * \sin (28.65 L/R))$$

$$T = R \tan (D/2) \text{----> } \underline{\text{D is deflection angle}}$$

$$C = 2R \sin (D/2)$$

$$E = R (1 / \cos(D/2)) - 1$$

$$M = R (1 - \cos (D/2)) \text{.....> } \underline{\text{if do not know } S < L \text{ or } S > L}$$

$$L = R * D * \pi / 180$$



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Air Dan Air Sisa
(Water and Wastewater Engineering)

KNS 4233

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 18 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 12.00 pm
Tempat <i>(Place)</i>	: Dewan Kuliah 1	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Law Puong Ling		

- Arahan**
(Instruction)
1. Pelajar perlu menjawab semua 4 soalan.
(Student must answer all FOUR Questions.)
 2. Baca soalan dengan teliti sebelum menjawab.
(Read the questions carefully before answering.)
 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.
(Write the answers only in the answer books provided using only pen.)
 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.
(No talking or disturbing other candidates during the duration of test.)
 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes.)

Question 1

- a. A settling column analysis is run on a type-1 suspension (discrete particles) for Sibujaya Water Treatment Plant (SJWT), Sibujaya Division. The settling column is 2 meters tall and the initial concentration of the well-mixed sample is 650 mg/L. Results of the analysis are shown below. [25 marks]

Time, minutes	0	58	77	91	114	154	256
Concentration remaining, mg/L	650	560	415	325	215	130	52

What is the theoretical removal efficiency of the settling basin that receives this suspension if the loading rate is 2.4×10^{-2} m/min?

Question 2

- a. Kota Samarahan is going to install rapid sand filters after their sedimentation tanks. The design loading rate to the filter is $200 \text{ m}^3/\text{d.m}^2$. How much filter surface area should be provided for their design flow rate of $0.5 \text{ m}^3/\text{s}$? If the maximum surface area for filter box is to be limited to 50 m^2 , how many filter boxes are required? The recommended acceptable maximum loading rate is $235 \text{ m}^3/\text{d}$. [10 marks]
- b. Clean water at 20°C is passed through a filter bed consisting of uniform sand at a velocity of 5 meters per hour. The sand grains in the filter bed are 0.4mm in diameter with a shape factor of 0.85 and a specific gravity of 2.65. The depth of the bed is 0.67 meter and the porosity is 0.4. Determine the head loss for clean water flow through the bed. [15 marks]
- Note: At 20°C ; $\rho=998.2 \text{ kg/m}^3$, $\mu=1.002 \times 10^{-3} \text{ N.s/m}^2$ or kg/m.s

Question 3

- a. Schematically sketch the flow diagram of a typical activated sludge treatment process. Label the components and briefly state the functions of each. [15 marks]
- b. Ten 5-ml samples of wastewater are placed in 300-ml BOD bottles. Half of the bottles are titrated immediately with an average initial concentration of dissolved oxygen (DO) of 7.9 mg/L. The remaining bottles are incubated for 5 days, after which the average DO is determined to be 4.5 mg/L. What is the standard BOD and ultimate carbonaceous BOD assuming deoxygenation rate constant $K_d=0.13$? [10 marks]

Question 4

Wastewater Treatment: Activated Sludge Process

An aeration tank of $30 \times 10 \times 5$ meters treats 5000 cubic meters per day of primary wastewater effluent containing 150 mg/L of ultimate BOD. Under steady-state condition, the aeration tank contains 2000 mg/L of MLVSS. The sludge recycle ratio is 0.3 and wasted sludge is 500 kg/day. Calculate

- a) Detention time in the aeration tank [05 marks]
- b) Concentration of return sludge [10 marks]
- c) Biological solids retention time if 90% substrate removal efficiency is desired, and the effluent suspended solids are not to exceed 20 mg/L [10 marks]

**KURSUS
KEJURTERAAN
MEKANIKAL DAN
SISTEM PEMBUATAN
(KNJ/KNP)**

**FAKULTI
KEJURUTERAAN**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Bahan Lanjutan
(Advanced Materials)

KNJ 3173

Peperiksaan : Akhir
(Examination)

Tarikh : 7 November 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 9.00 am -12.00 pm
(Time)

Tempat : Bilik Seminar 12
(Place)

Jangkamasa : 3 jam
(Duration)

Pensyarah : Prof. Madya Dr. Sinin Hamdan
(Lecturer)

Arahan : 1.
(Instruction)

Jawab SEMUA soalan.
(Answer ALL questions).

2. Baca soalan dengan teliti sebelum menjawab.
(Read the questions carefully before answering).

3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.
(Write the answers only in the answer books provided using only pen).

4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.
(No talking or disturbing other candidates during the duration of test).

5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

- a. Define composite material and explain why use composites? [5 marks]
- b. Why use fibres as reinforcement and write the two fundamental principles provided by the fibres that enhance strength and stiffness. [5 marks]
- c. Differentiate the properties between reinforcement and matrices. [5 marks]

Question 2

- a. There are 7 parameters to be considered in processing thermosets. Name 5 of them. [5 marks]
- b. Name the 5 principal manufacturing processes for thermosetting systems. [5 marks]
- c. Why mechanical fastening is preferable compared to adhesive bonding? Give one reason why it should be avoided. [5 marks]

Question 3

- a. What is the objective of fatigue testing? [5 marks]
- b. List the factors affecting fatigue behaviour of composites. [5 marks]

Question 4

- a. Explain the principle of Charpy and Izod tests. **[5 marks]**

- b. Discuss the effects of moisture on the fibre/matrix interface. **[5 marks]**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Bahan I
(Engineering Materials II)

KNJ 1042

Peperiksaan : Akhir
(Examination)

Tarikh : 7 November 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 2.00 pm - 5.00 pm
(Time)

Tempat : DK 1
(Place)

Jangkamasa : 3 jam
(Duration)

Pensyarah : Puan Mahshuri Yusof
(Lecturer)

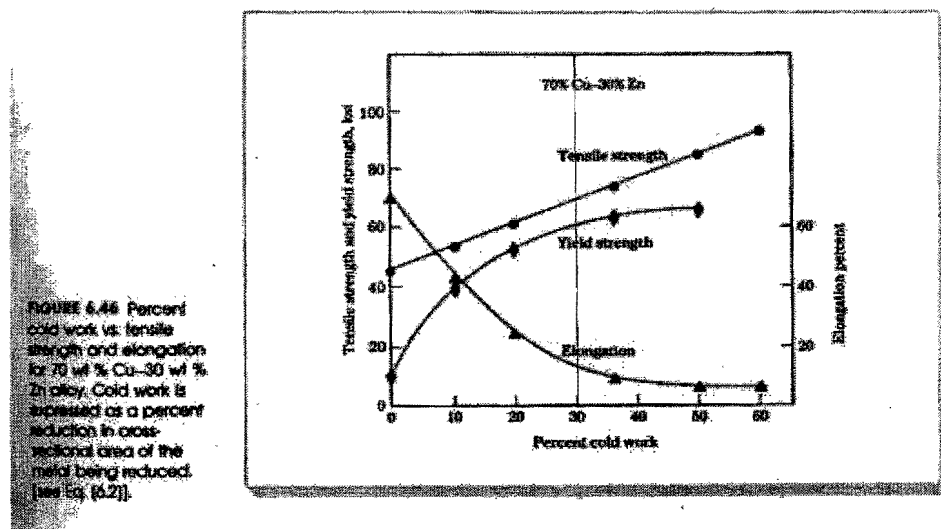
- Arahan** : 1. **Jawab SEMUA soalan.**
(Instruction) *(Answer ALL questions).*
2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1 [15 marks]

- What special techniques must be used to produce single crystals? [1 mark]
- What are the conditions that are favourable for extensive solid solubility of one element in another? [8 marks]
- Why are grain boundaries favourable sites for the nucleation and growth of precipitates? [2 marks]
- Describe Frenkel imperfection and Schottky imperfection. [4 marks]

Question 2 [20 marks]

- Calculate the fraction of atom sites that are vacant for lead at its melting temperature of 327 C (600 K). Assume energy for vacancy formation of 0.55 eV/atom. (Boltzmann's constant = 1.38×10^{-23} J/atom-K or 8.62×10^{-5} eV/atom-K) [5 marks]
- A 70% Cu-30% Zn brass wire is cold-drawn 20 percent to a diameter of 2.80 mm. The wire is then further cold-drawn to a diameter of 2.45 mm. [5 marks]
 - Calculate the total percent cold work which the wire undergoes
 - Estimate the wire's tensile and yield strengths and elongation from figure below



- A 10-mm diameter Brinell hardness indenter produced an indentation 2.50 mm in diameter in a steel alloy when a load of 1000 kg was used. Compute the HB of this material. What will be diameter of an indentation to yield a hardness of 300 HB when a 500 kg load is used? (Refer Table 1 in Appendix) [10marks]

Question 3 [35 marks]

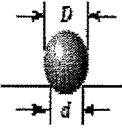
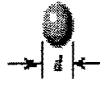


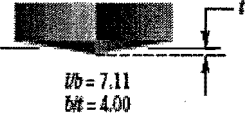



- a. Give the strong reasons why
- (i) A400 M military transport plane applies structural composites at wing box, skin panel and spars? [2 marks]
 - (ii) Titanium alloys are applied in human implants? [2 marks]
- b. Calculate the force of attraction between a K^+ and O^{2-} ion the centers of which are separated by a distance of 1.5 nm. (The permittivity of free space = $8.85 \times 10^{-12} C^2 / (Nm^2)$, and electron charge = $1.6 \times 10^{-19} C$) [2 marks]
- c. Within a cubic unit cell, sketch the following directions: [8 marks]
- (a) $[\bar{1}10]$ (b) $[121]$ (c) $[0\bar{1}2]$ (d) $[\bar{1}2\bar{1}]$
- d. Make the phase analyses at the following points in the platinum-silver equilibrium phase diagram in the Figure 1 (Refer Appendix). The analyses are including the phase present, composition and the amount of the phase. Show your calculation to determine the amount of phase. [21 marks]
- (i) At 42.4% Ag and 1400 °C
 - (ii) At 42.4% Ag and 1186 °C + ΔT (just above 1186 °C)
 - (iii) At 42.4% Ag and 1186 °C - ΔT (just below 1186 °C)
 - (iv) At 60% Ag and 1150 °C

Question 4 [30 marks]

- a. Give two reasons why the well-established joining technologies for metallic structures are not directly applicable to composites? [4 marks]
- b. How preliminary surface preparation treatment of adhesive bonding can improve the strength of the joint? [6 marks]
- c. Give two examples of polymer adhesives that can be used to bond the composite. [4 marks]
- d. Give two drawbacks of adhesive bonding. [4 marks]
- e. Illustrate the following joints: [12 marks]
- (1) Single lap joint
 - (2) Double lap joint
 - (3) Double strap joint
 - (4) Stepped lap joint
 - (5) Double stepped lap joint
 - (6) Double scarf joint

Appendix

Table 1: Hardness Testing Technique

Test	Indenter	Shape of Indentation		Load	Formula for Hardness Number ^a
		Side View	Top View		
Brinell	10-mm sphere of steel or tungsten carbide			P	$HB = \frac{2P}{\pi D [D - \sqrt{D^2 - d^2}]}$
Vickers microhardness	Diamond pyramid			P	$HV = 1.854P/d_1^2$
Knoop microhardness	Diamond pyramid			P	$HK = 14.2P/t^2$
Rockwell and Superficial Rockwell	{ Diamond cone $\frac{1}{16}, \frac{1}{8}, \frac{1}{4}, \frac{1}{2}$ in. diameter steel spheres			{ 60 kg } { 100 kg } Rockwell { 150 kg } { 15 kg } { 30 kg } Superficial Rockwell { 45 kg }	

^a For the hardness formulas given, P (the applied load) is in kg, while D, d, d₁, and t are all in mm.

Source: Adapted from H. W. Hayden, W. G. Moffatt, and J. Wulff, *The Structure and Properties of Materials*, Vol. III, *Mechanical Behavior*. Copyright © 1965 by John Wiley & Sons, New York. Reprinted by permission of John Wiley & Sons, Inc.

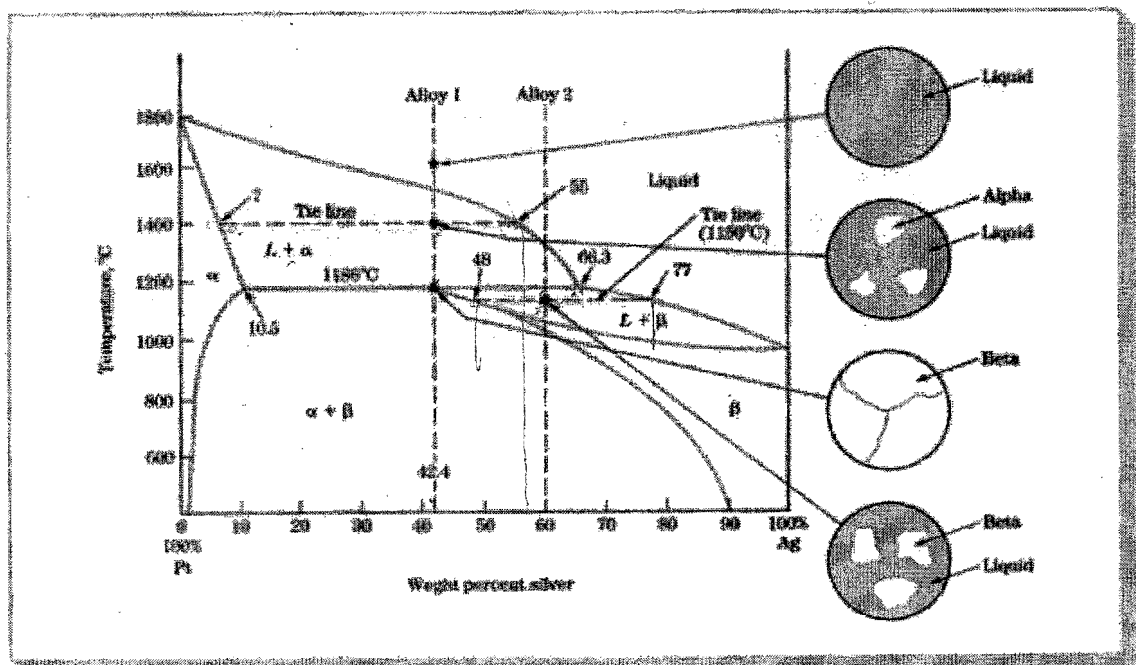


Figure 1: The platinum-silver phase diagram



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Termodinamik I
(Thermodynamics I)

KNJ 1033

Peperiksaan : Akhir
(Examination)

Tarikh : 9 November 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 9.00 am – 11.30 am
(Time)

Tempat : Bilik Seminar 23
(Place)

Jangkamasa : 2 ½ jam
(Duration)

Pensyarah : Pn. Shanti Faridah Salleh
(Lecturer)

Arahan : 1. Jawab EMPAT (4) soalan sahaja.
(Instruction) (Answer FOUR (4) questions only.)

2. Baca soalan dengan teliti sebelum menjawab.
(Read the questions carefully before answering.)

3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.
(Write the answers only in the answer books provided using only pen.)

4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.
(No talking or disturbing other candidates during the duration of test.)

5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes.)

Answer FOUR (4) questions only. Each question worth 25 marks.

QUESTION 1

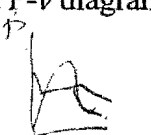
A mass of 5 kg saturated liquid-vapour mixture of water is contained in a piston-cylinder device at 100 kPa. Initially, 2 kg of water is in liquid phase and the rest is in the vapour phase. Heat is now transferred to the water, and the piston starts moving when the pressure inside reaches 200 kPa. Heat transfer continues until the volume increases by 20 percent. Determine:

(a) the initial and final temperatures [7 marks]

$m = \frac{m_l}{m}$ (b) the mass of liquid water when the piston first starts moving [7 marks]

$v = \frac{V}{m}$ (c) the work done during this process $W_{net} =$ [7 marks]

$m = \frac{V}{v}$ (d) show the process on a P-v diagram [4 marks]



QUESTION 2

(a) How does forced convection differ from natural convection? What is blackbody? How do real bodies differ from a blackbody? [9 marks]

(b) The inner and outer surfaces of a 0.5 cm thick 2m x 2 m window glass in winter are 10°C and 3°C, respectively. If the thermal conductivity of the glass is 0.78 W/m°C, determine the amount of heat loss, in kJ, through the glass over a period of 5 hr. [10 marks]

(c) What would be your answer be if the glass in 2(b) were 1-cm thick? [6 marks]

QUESTION 3

(a) Is it possible for a heat engine to operate without rejecting any waste heat to a low temperature reservoir? Explain. [5 marks]

(b) A heat pump with a COP of 2.4 is used to heat a house. When running, the heat pump consumes 8 kW of electric power. If the house is losing heat to the outside at an average rate of 40,000 kJ/h and the temperature of the house is 3°C when the

heat pump is turned on, determine how long it will take for the temperature in the house to rise to 22°C. Assume the house is well sealed and take the entire mass within the house to be equivalent to 2000 kg of air. [20 marks]

QUESTION 4

1 m³ of air is heated reversibly at constant pressure from 15°C to 300°C, and is then cooled reversibly at constant volume back to the initial temperature. The initial pressure is 1.03 bar. Calculate the net heat flow and the overall change of entropy. Sketch the process on a T-s diagram. [25 marks]

QUESTION 5

Steam flows steadily through an adiabatic turbine. The inlet conditions of the steam are 10 MPa, 450°C, and 80 m/s, and the exit conditions are 10 kPa, 92 percent quality, and 50 m/s. The mass flow rate of the steam is 12 kg/s. Determine:

(a) the change in kinetic energy, [6 marks]

(b) the power output, $\frac{1}{2} m v^2$ [12 marks]

(c) turbine inlet area. $m = \frac{1}{v_1} v_1 A_1$ [7 marks]

$$m \left(h_1 + \frac{v_1^2}{2} \right) = W_{out} + m \left(h_2 + \frac{v_2^2}{2} \right)$$



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Termodinamik II
(Thermodynamics II)

KNJ 2094 / 2093

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 9 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Mohammad Omar Abdullah		

- Arahan**
(Instruction)
1. **Jawab SATU (1) soalan daripada Bahagian A dan EMPAT (4) soalan daripada Bahagian B.**
(Answer ONE (1) question from Section A and any FOUR (4) questions from Section B)
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen)
 4. **Serahkan kertas jawapan berasingan untuk kedua-dua seksyen tersebut.**
(Submit the answer scripts separately for both sections)
 5. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 6. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Instruction:

Answer only one (1) question from Part A and any four (4) questions from part B.

PART A (Answer only one question)

Question 1.

The dry- and wet-bulb temperature readings of a room were 25 °C and 19.9 °C respectively. Using the psychrometric chart shown in next page, taking the atmospheric pressure as 1.01325 bar, determine:

- (i) the specific humidity (humidity ratio). [2%]
- (ii) the percentage saturation (relative humidity). [3%]
- (iii) the dew point. [3%]
- (iv) the specific volume of the mixture. [3%]
- (v) the specific enthalpy of the mixture. [3%]
- (vi) Suppose the room is cooled until the air is saturated at 5 °C and then heated at constant pressure until the dry bulb temperature is 17.5 °C, both processes occurring at constant pressure. Calculate the heat rejected in the cooling process (per kg of dry air) and the heat supplied in the heating process (per kg of dry air). [6 %]

Question 2.

Exhaust gas from a car is analyzed and found to made up of 25% N₂, 35% O₂, 20% CO₂ and 20% CO by volume. Calculate:

- (a) the molar mass of the mixture. [4%]
- (b) the partial pressure of each constituent when the total pressure is 1.5 bar. [4%]
- (c) the density of the mixture at 1.5 bar and 15°C. [5%]
- (d) the isentropic index, γ of the mixture. The molar heat capacities \hat{c}_p and \hat{c}_v are given in the following table. [7%]

Gas	\hat{c}_p	\hat{c}_v
	(kJ / kmol K)	
N ₂	29.134	20.819
O ₂	29.382	21.608
CO ₂	37.219	28.906
CO	29.158	20.845

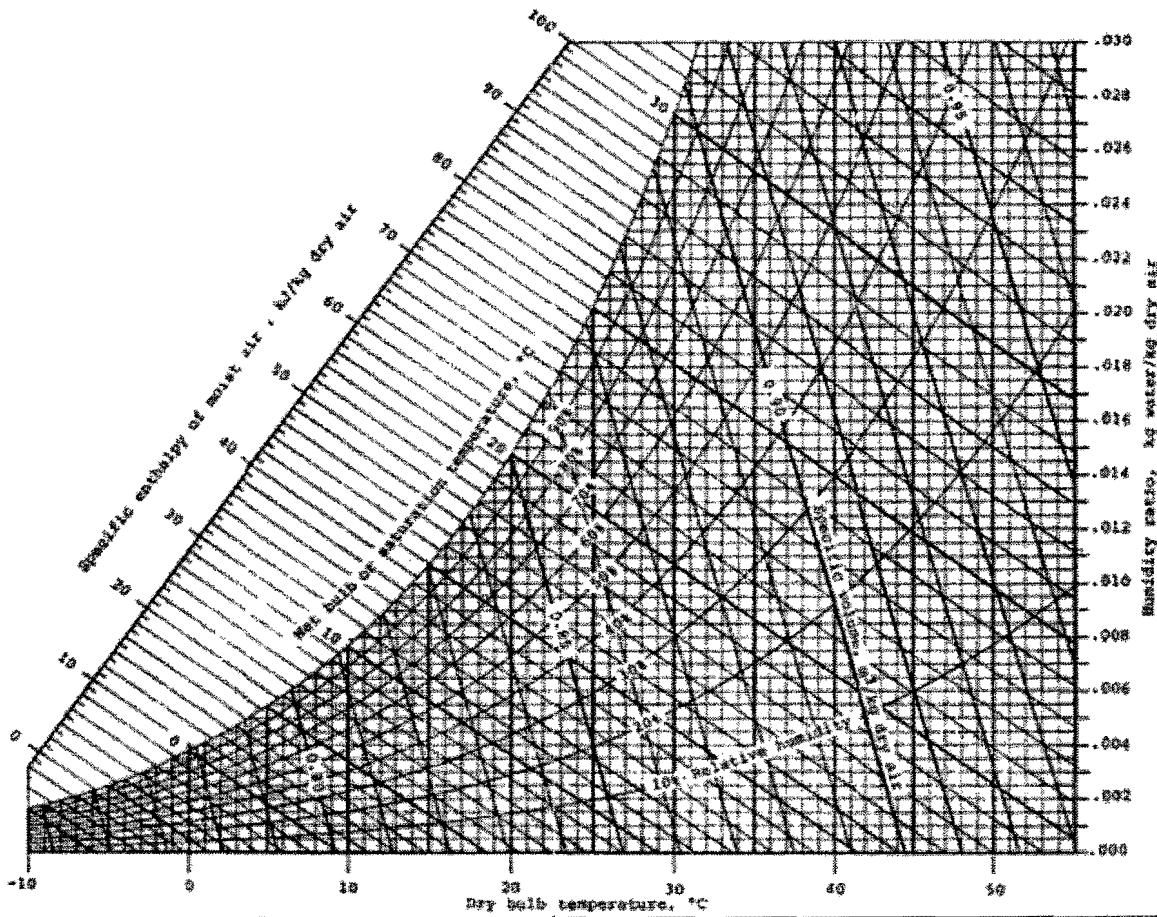


Fig. 1 Psychrometric chart

PART B (Answer 4 questions from this section)

Question 3.

(a) Show that the thermodynamics efficiency of an ideal Brayton Cycle is

$$\eta = 1 - \frac{1}{r_p^{\frac{\gamma-1}{\gamma}}} \quad [6 \%]$$

where r_p is the pressure ratio, P_2/P_1

(b) A gas turbine has an overall pressure ratio of 5 and a maximum cycle temperature of 550 °C. The turbine drives the compressor and an electric generator, the mechanical efficiency of the drive being 97%. The ambient temperature is 20 °C and air enters the compressor at a rate of 15 kg/s, the isentropic efficiencies of the compressor and turbine are 80% and 83%. Neglecting changes in kinetic energy, the mass flow rate of fuel and all pressure losses, calculate:

- (i) the power output. [7 %]
(ii) the cycle efficiency. [7 %]

Question 4.

In a refrigerating plant using 134a the vapour leaves the evaporator dry saturated at 1.826 bar and is compressed by a compressor to 7.449 bar. The temperature of the vapour leaving the compressor is 45°C. The liquid leaves the condenser at 25°C, and is throttled to the evaporator temperature.

- (a) For a compression cycle, explain why a compressor is used instead of a pump. [2%]
(b) Draw the t-s diagram for the above process [3%]
(c) Calculate:
(i) the refrigerating effect; [4%]
(ii) the specific work input; [4%]
(iii) the coefficient of performance. [4%]
(d) the Carnot efficiency and compare the value to (c(iii)) above. [3%]

Question 5.

A quantity of coal used in a boiler had the following analysis: 82% C; 5% H ; 6% O, 2% N and 5% ash. The dry flue gas analysis showed 14% CO₂ and some oxygen. Calculate:

- (a) The oxygen content of the dry flue gas. [10%]
(b) The air-fuel ratio and the excess air supplied. [10%]

Question 6.

In a particular reheat steam power plant, steam is supplied to a two-stage turbine at 40 bar and 350 °C. It expands in the first stage turbine until it is just dry saturated, then it is reheated to 350 °C. and expand to the second stage of turbine. The condenser pressure is 0.035 bar. Assuming ideal processes and neglecting the feed pump term. Calculate:

- (a) the work output (per kg of steam for the plant). [4%]
- (b) the heat supplied (per kg of steam for the plant). [4%]
- (c) the specific steam consumption. [4%]
- (d) the cycle efficiency. [4%]
- (e) If the expansion processes have isentropic efficiencies of 84% and 78% respectively, for the first and second stages, now calculate the cycle efficiency and compare with the value in (d) above. [4%]

Question 7.

- (a) Sketch a reciprocating piston-cylinder IC engine and label the important parts. [3 %]
 - (b) Sketch a standard P-V and T-s diagram of an Otto Cycle. Show all the internally reversible processes on both of the diagrams. [4 %]
 - (c) List 2 differences in between the above engine with that of two-stroke engine. [3 %]
 - (d) Consider an air standard Otto Cycle where the maximum and minimum temperatures are 1400 and 15°C. The heat supplied per kg of air is 800kJ.
 - (i) Calculate the compression ratio and [5 %]
 - (ii) Determine the cycle efficiency. [5 %]
- Data: take the c_p , c_v and γ of air as 1.005kJ/kg.K, 0.718 kJ/kg.K and 1.4 respectively.

Question 8.

In a typical Rankine steam cycle plant, steam is supplied dry saturated at 40 bar to a turbine and the condense pressure is 0.035 bar.

- (a) Calculate per kg of steam:
 - (i) the work output neglecting the feed-pump work [3 %]
 - (ii) the work required for the feed pump [3 %]
 - (iii) the heat transferred to the condenser cooling water, and the amount of cooling water required through the condenser if the temperature rise of the water is assumed to be 5.5 K. [3 %]
 - (iv) the heat supplied. [3 %]
 - (v) the Rankine efficiency. [3 %]
 - (vi) the specific steam consumption (ssc). [3 %]
- (b) Calculate the Carnot efficiency for the same condition above. [2 %]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Statik
(Statics)

KNJ 1013

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 11 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am -11.30 am
Tempat <i>(Place)</i>	: Bilik Seminar 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: En. A. Rahim Md. Amin		

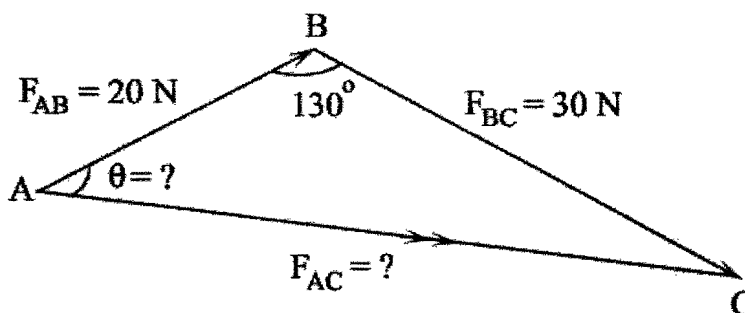
- Arahan**
(Instruction)
1. **Jawab SEMUA soalan di Bahagian A dan TIGA (3) soalan di Bahagian B.**
(Answer ALL questions in Section A and THREE (3) questions in Section B).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Section A
Answer ALL Questions**Question A1**

Fill in the SI units for the quantities in the table below:

[4 marks]

Quantity	SI Unit
Length	
Force	
Momentum	
Moment of Inertia	

Question A2The weight of an instrument on earth at sea level is 500 N. What is its weight on the moon with the acceleration due to gravity equal to 1.6 m/s^2 .**[3 marks]****Question A3**The centers of two steel spheres are 1.5 m apart. The mass of each sphere is 500 kg. What gravitational force do they exert on each other? (The universal gravitational constant, $G=6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$.)**[4 marks]****Question A4**Use rule of trigonometry to solve the force F_{AC} in figure A1. What is the angle θ ?**[5 marks]****Figure A1**

Question A5

What is the magnitude of force F in order to maintain the system of [2 marks]
forces in figure A2 in equilibrium?

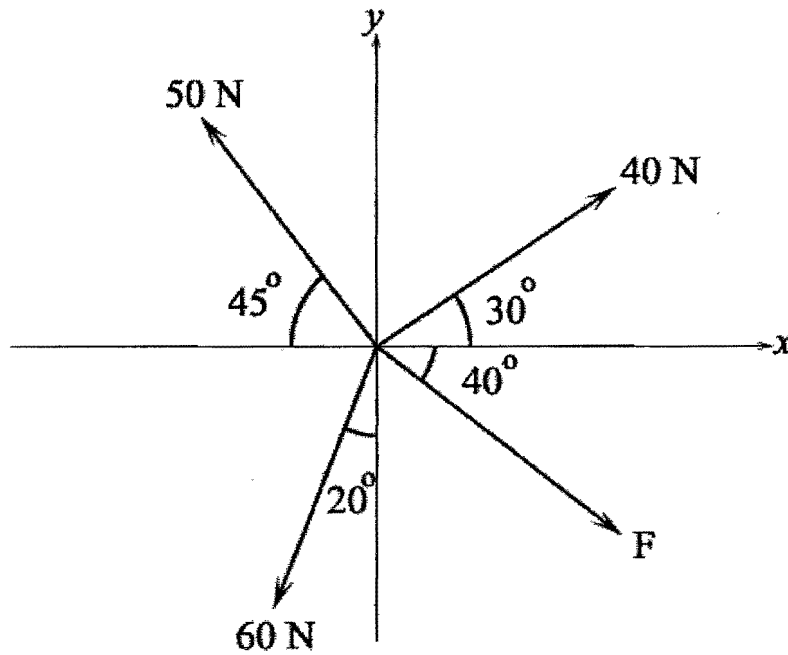
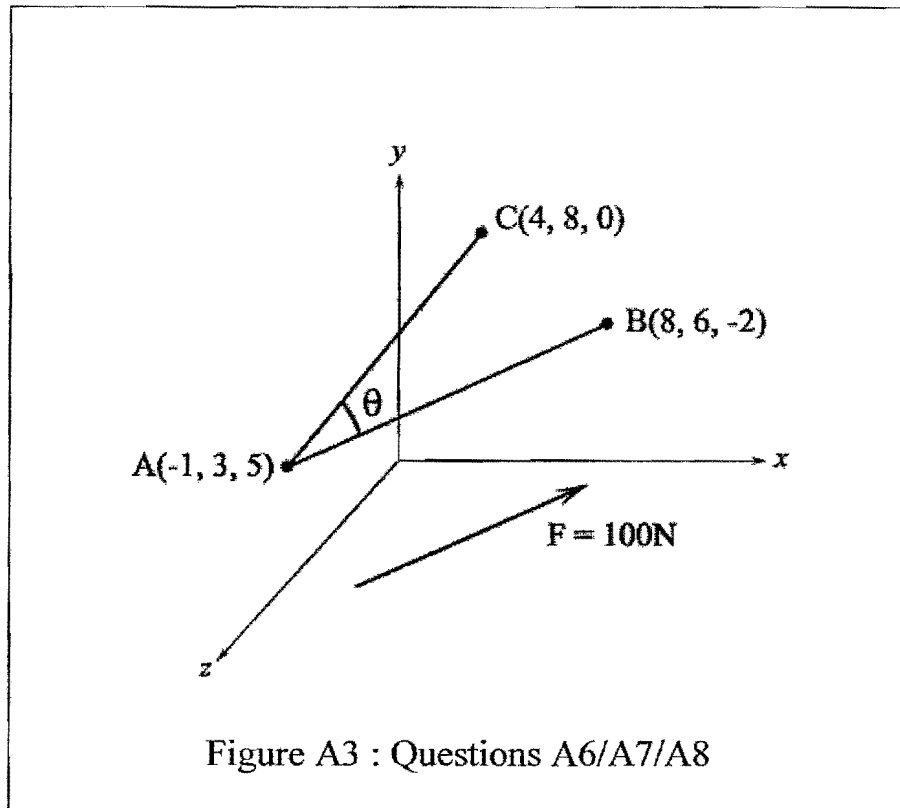


Figure A2



Question A6

For line AB in figure A3, determine its position vector, and unit vector.

[4 marks]

Question A7

The force F in figure A4 has a magnitude 100N. If its line of action is parallel to line AB, what is its components in the x, y, and z-direction?

[2 marks]

Question A8

What is the angle θ in figure A4?

[6 marks]

Question A9

If $U = 3\mathbf{i} + 4\mathbf{j} - 2\mathbf{k}$, $V = 5\mathbf{i} + 3\mathbf{j} + \mathbf{k}$, and $W = -2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$, what is $U \cdot (V \times W)$?

[6 marks]

Question A10

The total length of a spring when not loaded is 5 cm. What is its new length when a mass of 50kg is hanged at its end. The spring stiffness is 32.7 kN/m.

[4 marks]

Section B
Answer **THREE** questions only

Question B1

- a. C is the centroid of the shape in figure B1. Calculate \bar{x} and \bar{y} . [Hint: [10 marks] vertical strip.]

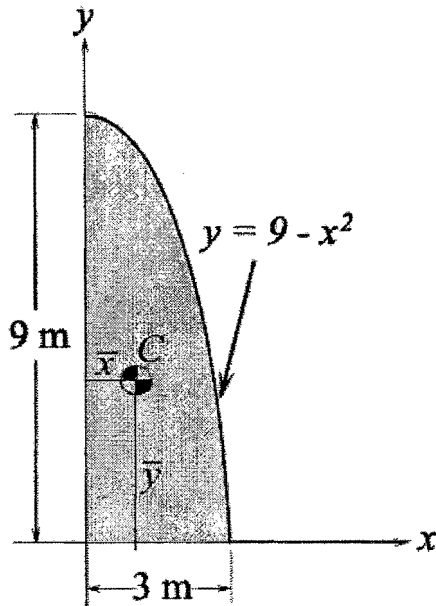


Figure B1 : Question B1(a)

- b) C is the centroid for the composite shape in figure B2. Calculate \bar{x} and \bar{y} . [10 marks]

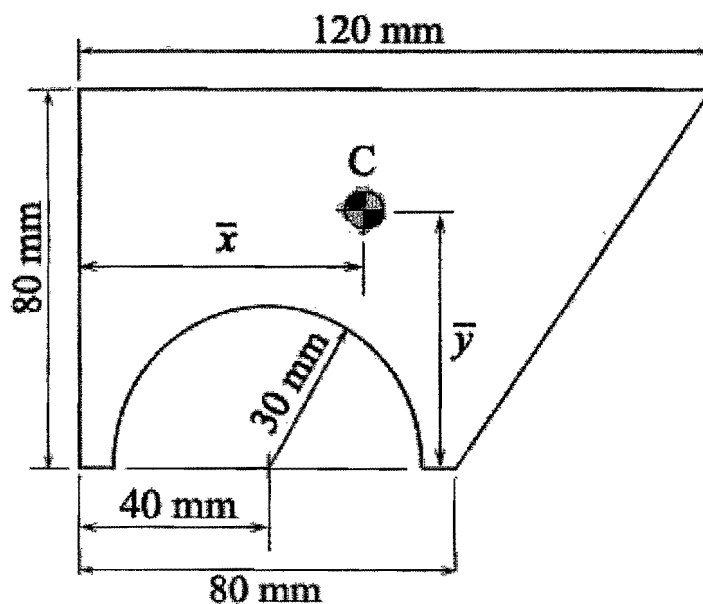


Figure B2 : Question B1(b)

Question B2

For the structure in figure B3, calculate the forces in members DE, [20 marks]
FE, DF, CD, GF, and CF.

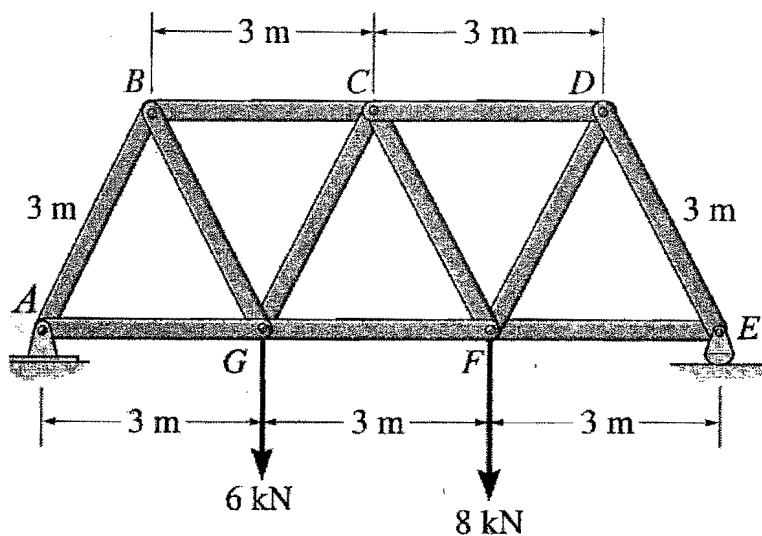


Figure B3 : Question B2

Question B3

Beam AF which is simply supported at point B and E carries a [20 marks]
uniformly distributed load of 30 kN/m from A to C, point load of 50 kN at D and another uniformly distributed load of 20 kN/m from E to F.

Draw a shear force diagram and bending moment diagram for the beam.

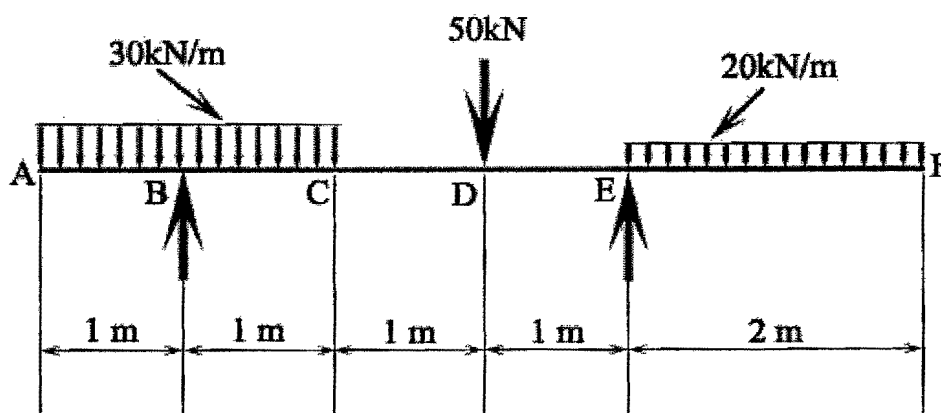


Figure B4 : Question B3

Question B4

- a. For the shape in figure B5, calculate its moment of inertia about the y-axis, I_y . [Hint: vertical strip] [10 marks]

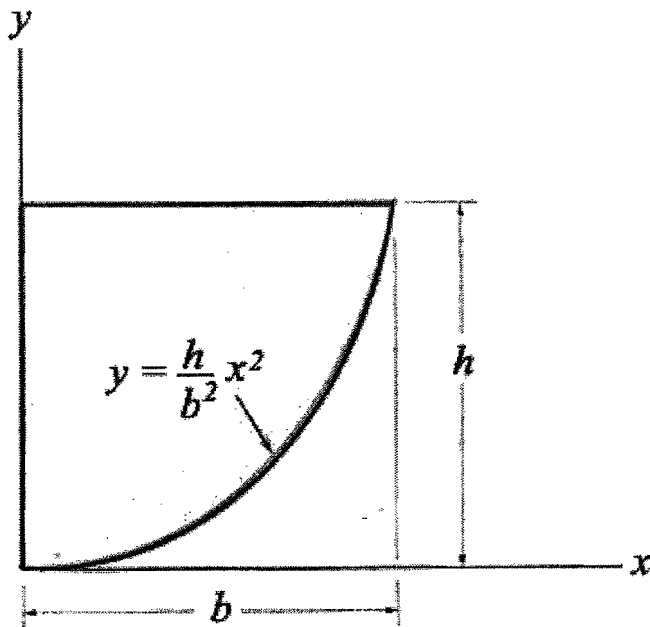


Figure B5 : Question B4(a)

- b. For the composite shape in figure B6, calculate its moment of inertia about the x-axis, I_x , and its radius of gyration, k_x . [10 marks]

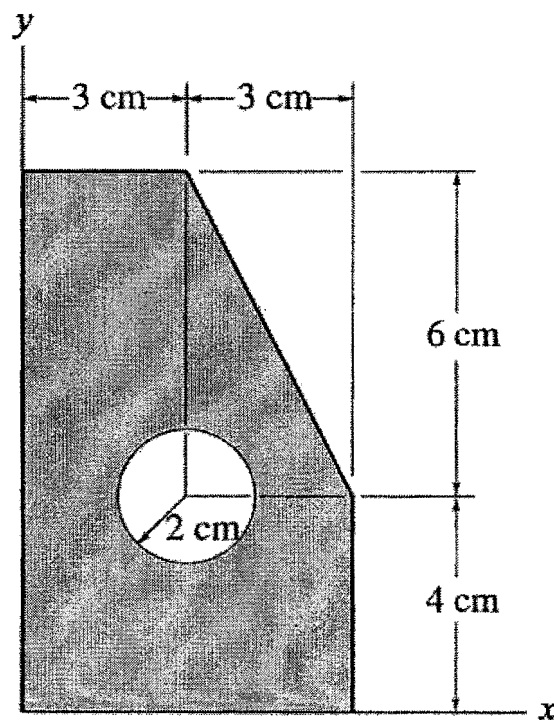


Figure B6 : Question B4(b)

Question B5

- The line of action of the 60 kN force F in figure B7 passes through points R and S . What is the moment of F about point Q ? [8 marks]
- What is the perpendicular distance from point A to the line of action of F ? [4 marks]
- What is the moment of F about the line that passes through the origin O $(0,0,0)$ and point Q ? [8 marks]

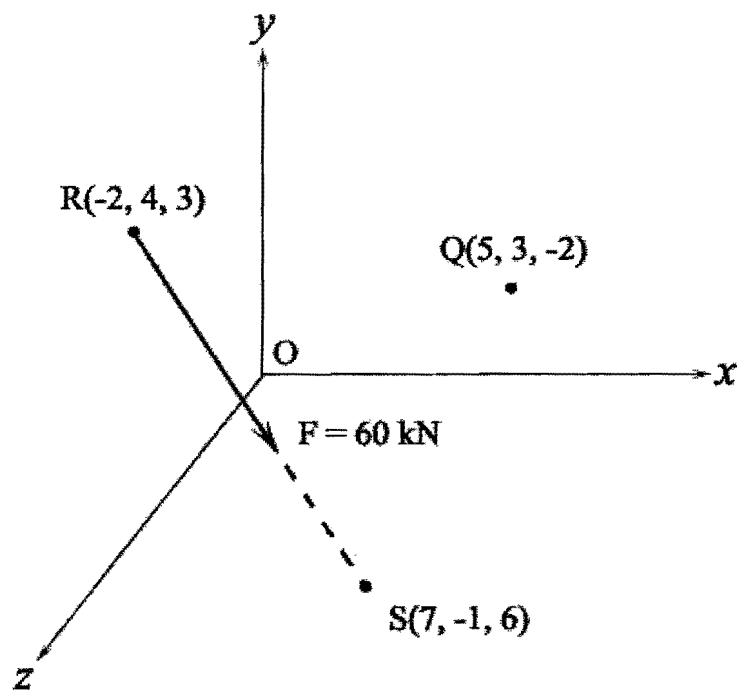


Figure B7 : Question B5



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Mekanik Bendalir II
(Fluid Mechanics II)

KNJ 2103

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 14 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Andrew R.H. Rigit		

- Arahan**
(Instruction)
1. **Jawab semua empat soalan.**
(Answer all four (4) questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam kertas jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer sheets provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Question 1

Air flows isentropically through a duct with $T_0 = 300^\circ\text{C}$. At two sections with identical areas of 25 cm^2 , the pressures are $p_1 = 120\text{ kPa}$ and $p_2 = 60\text{ kPa}$. [25 marks]

By using Table B.1 (Isentropic Flow of a Perfect Gas, $k = 1.4$), determine:

- (i) Ma_2 ,
- (ii) the throat area, and
- (iii) the mass flow rate.

Please state your assumption(s) in solving this problem.

Question 2

Air flows in a duct of diameter 5 cm . At one section, the total stagnation temperature, $T_0 = 300^\circ\text{C}$, $P = 120\text{ kPa}$, and $\dot{m} = 0.4\text{ kg/s}$. Estimate, at this section, [25 marks]

- (i) Velocity, V ,
- (ii) Ma , and
- (iii) ρ_0 .

Please state your assumption(s) in solving this problem.

Note: $k = 1.4$ and $c_p = 1005\text{ m}^2/\text{s}^2\text{K}$ for air.

Question 3

Air at 20°C and 1 atm flows past the plate in Fig. Q3. The two pitot tubes are each 2 mm from the wall. The manometer fluid is water at 20°C . If $U = 15\text{ m/s}$ and $L = 50\text{ cm}$, determine the values of the manometer readings h_1 and h_2 in cm . Assume laminar boundary-layer flow. [25 marks]

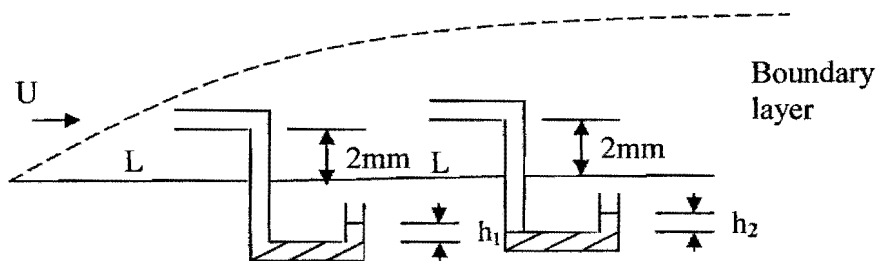


Fig. Q3

Note: For air at 20°C , density $\rho = 1.2\text{ kg/m}^3$ and viscosity $\mu = 1.8 \times 10^{-5}\text{ kg/m.s}$.

Question 4

[25 marks]

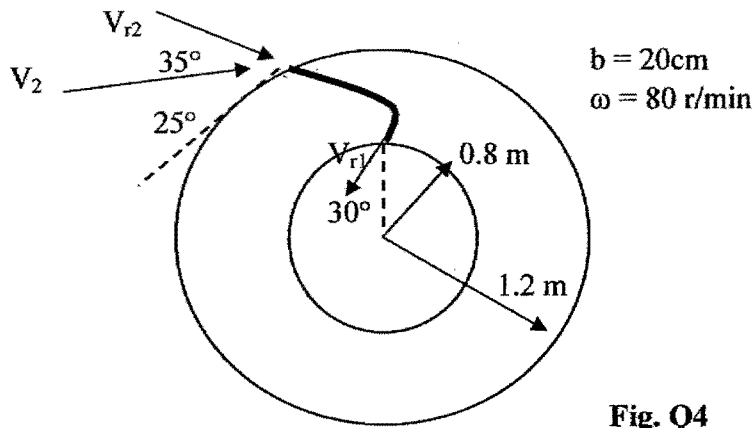


Fig. Q4

An idealized radial turbine is shown in Fig. Q4. The absolute flow enters at 25° with the blade angles as shown. The flow rate is $8 \text{ m}^3/\text{s}$ of water at 20°C . The blade thickness is constant at 20 cm . Calculate the theoretical power developed at 100% efficiency.

Note:

Detailed velocity vector diagrams at (2) outlet and (1) inlet for Fig. Q4.

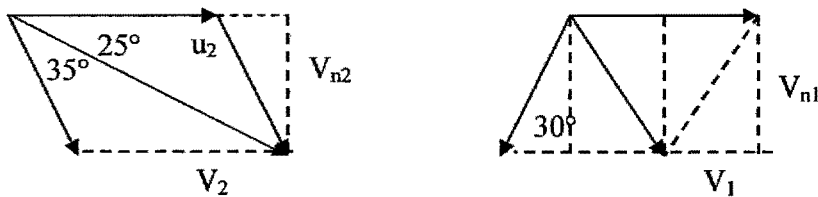


Table 1: The Blasius Solution

$y[U/(vx)]^{1/2}$	u/U	$y[U/(vx)]^{1/2}$	u/U
0.0	0.0	2.8	0.81152
0.2	0.06641	3.0	0.84605
0.4	0.13277	3.2	0.87609
0.6	0.19894	3.4	0.90177
0.8	0.26471	3.6	0.92333
1.0	0.32979	3.8	0.94112
1.2	0.39378	4.0	0.95552
1.4	0.45627	4.2	0.96696
1.6	0.51676	4.4	0.97587
1.8	0.57477	4.6	0.98269
2.0	0.62977	4.8	0.98779
2.2	0.68132	5.0	0.99155
2.4	0.72899	∞	1.00000
2.6	0.77246		

Table B.1: Isentropic Flow of a Perfect Gas ($k = 1.4$)

(Refer to Appendix B)

Appendix B

Compressible Flow Tables

e B.1
Isentropic Flow
Perfect Gas,
 $\gamma = 1.4$

Ma	p/p_0	ρ/ρ_0	T/T_0	A/A^*	Ma	p/p_0	ρ/ρ_0	T/T_0	A/A^*
0.0	1.0	1.0	1.0	∞	0.74	0.6951	0.7712	0.9013	1.0681
0.02	0.9997	0.9998	0.9999	28.9421	0.76	0.6821	0.7609	0.8964	1.0570
0.04	0.9989	0.9992	0.9997	14.4815	0.78	0.6690	0.7505	0.8915	1.0471
0.06	0.9975	0.9982	0.9993	9.6659	0.8	0.6560	0.7400	0.8865	1.0382
0.08	0.9955	0.9968	0.9987	7.2616	0.82	0.6430	0.7295	0.8815	1.0305
0.1	0.9930	0.9950	0.9980	5.8218	0.84	0.6300	0.7189	0.8763	1.0237
0.12	0.9900	0.9928	0.9971	4.8643	0.86	0.6170	0.7083	0.8711	1.0179
0.14	0.9864	0.9903	0.9961	4.1824	0.88	0.6041	0.6977	0.8659	1.0129
0.16	0.9823	0.9873	0.9949	3.6727	0.9	0.5913	0.6870	0.8606	1.0089
0.18	0.9776	0.9840	0.9936	3.2779	0.92	0.5785	0.6764	0.8552	1.0056
0.2	0.9725	0.9803	0.9921	2.9635	0.94	0.5658	0.6658	0.8498	1.0031
0.22	0.9668	0.9762	0.9904	2.7076	0.96	0.5532	0.6551	0.8444	1.0014
0.24	0.9607	0.9718	0.9886	2.4956	0.98	0.5407	0.6445	0.8389	1.0003
0.26	0.9541	0.9670	0.9867	2.3173	1.0	0.5283	0.6339	0.8333	1.0000
0.28	0.9470	0.9619	0.9846	2.1656	1.02	0.5160	0.6234	0.8278	1.0003
0.3	0.9395	0.9564	0.9823	2.0351	1.04	0.5039	0.6129	0.8222	1.0013
0.32	0.9315	0.9506	0.9799	1.9219	1.06	0.4919	0.6024	0.8165	1.0029
0.34	0.9231	0.9445	0.9774	1.8229	1.08	0.4800	0.5920	0.8108	1.0051
0.36	0.9143	0.9380	0.9747	1.7358	1.1	0.4684	0.5817	0.8052	1.0079
0.38	0.9052	0.9313	0.9719	1.6587	1.12	0.4568	0.5714	0.7994	1.0113
0.4	0.8956	0.9243	0.9690	1.5901	1.14	0.4455	0.5612	0.7937	1.0153
0.42	0.8857	0.9170	0.9659	1.5289	1.16	0.4343	0.5511	0.7879	1.0198
0.44	0.8755	0.9094	0.9627	1.4740	1.18	0.4232	0.5411	0.7822	1.0248
0.46	0.8650	0.9016	0.9594	1.4246	1.2	0.4124	0.5311	0.7764	1.0304
0.48	0.8541	0.8935	0.9559	1.3801	1.22	0.4017	0.5213	0.7706	1.0366
0.5	0.8430	0.8852	0.9524	1.3398	1.24	0.3912	0.5115	0.7648	1.0432
0.52	0.8317	0.8766	0.9487	1.3034	1.26	0.3809	0.5019	0.7590	1.0504
0.54	0.8201	0.8679	0.9449	1.2703	1.28	0.3708	0.4923	0.7532	1.0581
0.56	0.8082	0.8589	0.9410	1.2403	1.3	0.3609	0.4829	0.7474	1.0663
0.58	0.7962	0.8498	0.9370	1.2130	1.32	0.3512	0.4736	0.7416	1.0750
0.6	0.7840	0.8405	0.9328	1.1882	1.34	0.3417	0.4644	0.7358	1.0842
0.62	0.7716	0.8310	0.9286	1.1656	1.36	0.3323	0.4553	0.7300	1.0940
0.64	0.7591	0.8213	0.9243	1.1451	1.38	0.3232	0.4463	0.7242	1.1042
0.66	0.7465	0.8115	0.9199	1.1265	1.4	0.3142	0.4374	0.7184	1.1149
0.68	0.7338	0.8016	0.9153	1.1097	1.42	0.3055	0.4287	0.7126	1.1262
0.7	0.7209	0.7916	0.9107	1.0944	1.44	0.2969	0.4201	0.7069	1.1379
0.72	0.7080	0.7814	0.9061	1.0806	1.46	0.2886	0.4116	0.7011	1.1501

Table B.1 (Cont.)
Isentropic Flow of
a Perfect Gas,
 $k = 1.4$

Ma	p/p_0	ρ/ρ_0	T/T_0	A/A^*	Ma	p/p_0	ρ/ρ_0	T/T_0	A/A^*
1.48	0.2804	0.4032	0.6954	1.1629	2.56	0.0533	0.1232	0.4328	2.7891
1.5	0.2724	0.3950	0.6897	1.1762	2.58	0.0517	0.1205	0.4289	2.8420
1.52	0.2646	0.3869	0.6840	1.1899	2.6	0.0501	0.1179	0.4252	2.8960
1.54	0.2570	0.3789	0.6783	1.2042	2.62	0.0486	0.1153	0.4214	2.9511
1.56	0.2496	0.3710	0.6726	1.2190	2.64	0.0471	0.1128	0.4177	3.0073
1.58	0.2423	0.3633	0.6670	1.2344	2.66	0.0457	0.1103	0.4141	3.0647
1.6	0.2353	0.3557	0.6614	1.2502	2.68	0.0443	0.1079	0.4104	3.1233
1.62	0.2284	0.3483	0.6558	1.2666	2.7	0.0430	0.1056	0.4068	3.1830
1.64	0.2217	0.3409	0.6502	1.2836	2.72	0.0417	0.1033	0.4033	3.2440
1.66	0.2151	0.3337	0.6447	1.3010	2.74	0.0404	0.1010	0.3998	3.3061
1.68	0.2088	0.3266	0.6392	1.3190	2.76	0.0392	0.0989	0.3963	3.3695
1.7	0.2026	0.3197	0.6337	1.3376	2.78	0.0380	0.0967	0.3928	3.4342
1.72	0.1966	0.3129	0.6283	1.3567	2.8	0.0368	0.0946	0.3894	3.5001
1.74	0.1907	0.3062	0.6229	1.3764	2.82	0.0357	0.0926	0.3860	3.5674
1.76	0.1850	0.2996	0.6175	1.3967	2.84	0.0347	0.0906	0.3827	3.6359
1.78	0.1794	0.2931	0.6121	1.4175	2.86	0.0336	0.0886	0.3794	3.7058
1.8	0.1740	0.2868	0.6068	1.4390	2.88	0.0326	0.0867	0.3761	3.7771
1.82	0.1688	0.2806	0.6015	1.4610	2.9	0.0317	0.0849	0.3729	3.8498
1.84	0.1637	0.2745	0.5963	1.4836	2.92	0.0307	0.0831	0.3696	3.9238
1.86	0.1587	0.2686	0.5910	1.5069	2.94	0.0298	0.0813	0.3665	3.9993
1.88	0.1539	0.2627	0.5859	1.5308	2.96	0.0289	0.0796	0.3633	4.0763
1.9	0.1492	0.2570	0.5807	1.5553	2.98	0.0281	0.0779	0.3602	4.1547
1.92	0.1447	0.2514	0.5756	1.5804	3.0	0.0272	0.0762	0.3571	4.2346
1.94	0.1403	0.2459	0.5705	1.6062	3.02	0.0264	0.0746	0.3541	4.3160
1.96	0.1360	0.2405	0.5655	1.6326	3.04	0.0256	0.0730	0.3511	4.3990
1.98	0.1318	0.2352	0.5605	1.6597	3.06	0.0249	0.0715	0.3481	4.4835
2.0	0.1278	0.2300	0.5556	1.6875	3.08	0.0242	0.0700	0.3452	4.5696
2.02	0.1239	0.2250	0.5506	1.7160	3.1	0.0234	0.0685	0.3422	4.6573
2.04	0.1201	0.2200	0.5458	1.7451	3.12	0.0228	0.0671	0.3393	4.7467
2.06	0.1164	0.2152	0.5409	1.7750	3.14	0.0221	0.0657	0.3365	4.8377
2.08	0.1128	0.2104	0.5361	1.8056	3.16	0.0215	0.0643	0.3337	4.9304
2.1	0.1094	0.2058	0.5313	1.8369	3.18	0.0208	0.0630	0.3309	5.0248
2.12	0.1060	0.2013	0.5266	1.8690	3.2	0.0202	0.0617	0.3281	5.1210
2.14	0.1027	0.1968	0.5219	1.9018	3.22	0.0196	0.0604	0.3253	5.2189
2.16	0.0996	0.1925	0.5173	1.9354	3.24	0.0191	0.0591	0.3226	5.3186
2.18	0.0965	0.1882	0.5127	1.9698	3.26	0.0185	0.0579	0.3199	5.4201
2.2	0.0935	0.1841	0.5081	2.0050	3.28	0.0180	0.0567	0.3173	5.5234
2.22	0.0906	0.1800	0.5036	2.0409	3.3	0.0175	0.0555	0.3147	5.6286
2.24	0.0878	0.1760	0.4991	2.0777	3.32	0.0170	0.0544	0.3121	5.7358
2.26	0.0851	0.1721	0.4947	2.1153	3.34	0.0165	0.0533	0.3095	5.8448
2.28	0.0825	0.1683	0.4903	2.1538	3.36	0.0160	0.0522	0.3069	5.9558
2.3	0.0800	0.1646	0.4859	2.1931	3.38	0.0156	0.0511	0.3044	6.0687
2.32	0.0775	0.1609	0.4816	2.2333	3.4	0.0151	0.0501	0.3019	6.1837
2.34	0.0751	0.1574	0.4773	2.2744	3.42	0.0147	0.0491	0.2995	6.3007
2.36	0.0728	0.1539	0.4731	2.3164	3.44	0.0143	0.0481	0.2970	6.4198
2.38	0.0706	0.1505	0.4688	2.3593	3.46	0.0139	0.0471	0.2946	6.5409
2.4	0.0684	0.1472	0.4647	2.4031	3.48	0.0135	0.0462	0.2922	6.6642
2.42	0.0663	0.1439	0.4606	2.4479	3.5	0.0131	0.0452	0.2899	6.7896
2.44	0.0643	0.1408	0.4565	2.4936	3.52	0.0127	0.0443	0.2875	6.9172
2.46	0.0623	0.1377	0.4524	2.5403	3.54	0.0124	0.0434	0.2852	7.0471
2.48	0.0604	0.1346	0.4484	2.5880	3.56	0.0120	0.0426	0.2829	7.1791
2.5	0.0585	0.1317	0.4444	2.6367	3.58	0.0117	0.0417	0.2806	7.3135
2.52	0.0567	0.1288	0.4405	2.6865	3.6	0.0114	0.0409	0.2784	7.4501
2.54	0.0550	0.1260	0.4366	2.7372	3.62	0.0111	0.0401	0.2762	7.5891

Table B.1
(continued)
Isentropic Flow of
Perfect Gas,
 $\gamma = 1.4$

Ma	p/p_0	ρ/ρ_0	T/T_0	A/A^*	Ma	p/p_0	ρ/ρ_0	T/T_0	A/A^*
3.64	0.0108	0.0393	0.2740	7.7305	4.34	0.0042	0.0202	0.2098	14.4456
3.66	0.0105	0.0385	0.2718	7.8742	4.36	0.0041	0.0198	0.2083	14.6965
3.68	0.0102	0.0378	0.2697	8.0204	4.38	0.0040	0.0194	0.2067	14.9513
3.7	0.0099	0.0370	0.2675	8.1691	4.4	0.0039	0.0191	0.2053	15.2099
3.72	0.0096	0.0363	0.2654	8.3202	4.42	0.0038	0.0187	0.2038	15.4724
3.74	0.0094	0.0356	0.2633	8.4739	4.44	0.0037	0.0184	0.2023	15.7388
3.76	0.0091	0.0349	0.2613	8.6302	4.46	0.0036	0.0181	0.2009	16.0092
3.78	0.0089	0.0342	0.2592	8.7891	4.48	0.0035	0.0178	0.1994	16.2837
3.8	0.0086	0.0335	0.2572	8.9506	4.5	0.0035	0.0174	0.1980	16.5622
3.82	0.0084	0.0329	0.2552	9.1148	4.52	0.0034	0.0171	0.1966	16.8449
3.84	0.0082	0.0323	0.2532	9.2817	4.54	0.0033	0.0168	0.1952	17.1317
3.86	0.0080	0.0316	0.2513	9.4513	4.56	0.0032	0.0165	0.1938	17.4228
3.88	0.0077	0.0310	0.2493	9.6237	4.58	0.0031	0.0163	0.1925	17.7181
3.9	0.0075	0.0304	0.2474	9.7990	4.6	0.0031	0.0160	0.1911	18.0178
3.92	0.0073	0.0299	0.2455	9.9771	4.62	0.0030	0.0157	0.1898	18.3218
3.94	0.0071	0.0293	0.2436	10.1581	4.64	0.0029	0.0154	0.1885	18.6303
3.96	0.0069	0.0287	0.2418	10.3420	4.66	0.0028	0.0152	0.1872	18.9433
3.98	0.0068	0.0282	0.2399	10.5289	4.68	0.0028	0.0149	0.1859	19.2608
4.0	0.0066	0.0277	0.2381	10.7188	4.7	0.0027	0.0146	0.1846	19.5828
4.02	0.0064	0.0271	0.2363	10.9117	4.72	0.0026	0.0144	0.1833	19.9095
4.04	0.0062	0.0266	0.2345	11.1077	4.74	0.0026	0.0141	0.1820	20.2409
4.06	0.0061	0.0261	0.2327	11.3068	4.76	0.0025	0.0139	0.1808	20.5770
4.08	0.0059	0.0256	0.2310	11.5091	4.78	0.0025	0.0137	0.1795	20.9179
4.1	0.0058	0.0252	0.2293	11.7147	4.8	0.0024	0.0134	0.1783	21.2637
4.12	0.0056	0.0247	0.2275	11.9234	4.82	0.0023	0.0132	0.1771	21.6144
4.14	0.0055	0.0242	0.2258	12.1354	4.84	0.0023	0.0130	0.1759	21.9700
4.16	0.0053	0.0238	0.2242	12.3508	4.86	0.0022	0.0128	0.1747	22.3306
4.18	0.0052	0.0234	0.2225	12.5695	4.88	0.0022	0.0125	0.1735	22.6963
4.2	0.0051	0.0229	0.2208	12.7916	4.9	0.0021	0.0123	0.1724	23.0671
4.22	0.0049	0.0225	0.2192	13.0172	4.92	0.0021	0.0121	0.1712	23.4431
4.24	0.0048	0.0221	0.2176	13.2463	4.94	0.0020	0.0119	0.1700	23.8243
4.26	0.0047	0.0217	0.2160	13.4789	4.96	0.0020	0.0117	0.1689	24.2109
4.28	0.0046	0.0213	0.2144	13.7151	4.98	0.0019	0.0115	0.1678	24.6027
4.3	0.0044	0.0209	0.2129	13.9549	5.0	0.0019	0.0113	0.1667	25.0000
4.32	0.0043	0.0205	0.2113	14.1984					

Table B.2 Normal Shock Relations
for a Perfect Gas, $\gamma = 1.4$

Ma_{n1}	Ma_{n2}	p_2/p_1	$V_1/V_2 = \rho_2/\rho_1$	T_2/T_1	p_{02}/p_{01}	A_1^*/A_2^*
1.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.02	0.9805	1.0471	1.0334	1.0132	1.0000	1.0000
1.04	0.9620	1.0952	1.0671	1.0263	0.9999	1.0001
1.06	0.9444	1.1442	1.1009	1.0393	0.9998	1.0002
1.08	0.9277	1.1941	1.1349	1.0522	0.9994	1.0006
1.1	0.9118	1.2450	1.1691	1.0649	0.9989	1.0011
1.12	0.8966	1.2968	1.2034	1.0776	0.9982	1.0018
1.14	0.8820	1.3495	1.2378	1.0903	0.9973	1.0027
1.16	0.8682	1.4032	1.2723	1.1029	0.9961	1.0040
1.18	0.8549	1.4578	1.3069	1.1154	0.9946	1.0055
1.2	0.8422	1.5133	1.3416	1.1280	0.9928	1.0073
1.22	0.8300	1.5698	1.3764	1.1405	0.9907	1.0094
1.24	0.8183	1.6272	1.4112	1.1531	0.9884	1.0118



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Analisa Mekanik dan Mesin
(Analysis Mechanics & Machines)

KNJ 2222

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 15 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am -11.00 am
Tempat <i>(Place)</i>	: Bilik Seminar 23	Jangkamasa <i>(Duration)</i>	: 2 jam
Pensyarah <i>(Lecturer)</i>	: Pn. Ervina Junaidi		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan Bahagian A dan TIGA soalan Bahagian B.**
(Answer ALL questions in Section A and THREE questions in Section B).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

**.Answer ALL questions in Section A and THREE questions from Section B
The maximum marks obtainable for a question are shown in square bracket**

**SECTION A (40%)
(Answer ALL questions in this section)**

- A1** The mechanism shown in Figure A1 below is a top view of a fixture in a machining operation. Carefully examine the configuration of the components in the mechanism. Then answer the following leading questions to gain insight into the operation of the mechanism.

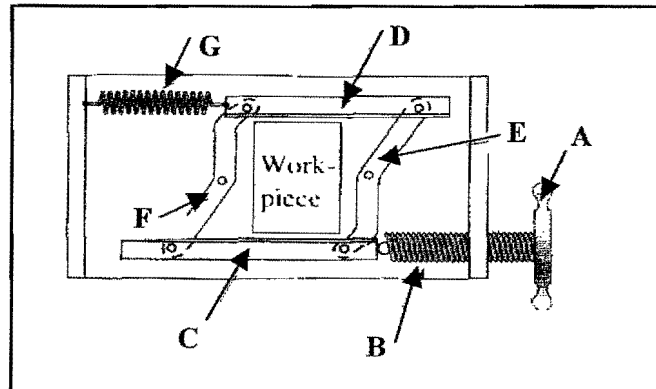


Figure A1

- a) As the handle A is turned, moving the threaded rod B to the left, describe the motion of grip C? **[2 marks]**
 - b) As the handle A is turned, moving the threaded rod B to the left, describe the motion of grip D? **[2 marks]**
 - c) What action would cause link D to move upward? **[2 marks]**
 - d) What is the purpose of spring G? **[2 marks]**
 - e) What is the purpose of this mechanism? **[1 marks]**
 - f) What would you call such a device? **[1 marks]**
- A2** Figure A2 (Appendix 1) shows the spreadsheet for spring design (the ends are squared and ground). Explain briefly the term *buckling* and *coil clearance* and also check the spring for buckling and coil clearance. **[10 marks]**
- A3** Explain briefly the difference between static and dynamic balancing. **[10 marks]**
- A4** With the aid of a figure, explain briefly the difference between free vibration and forced vibration. **[10 marks]**

SECTION B (60%)
(Answer THREE questions from this section)

B1 A gear train is shown in Figure B1. The gears have the following properties:

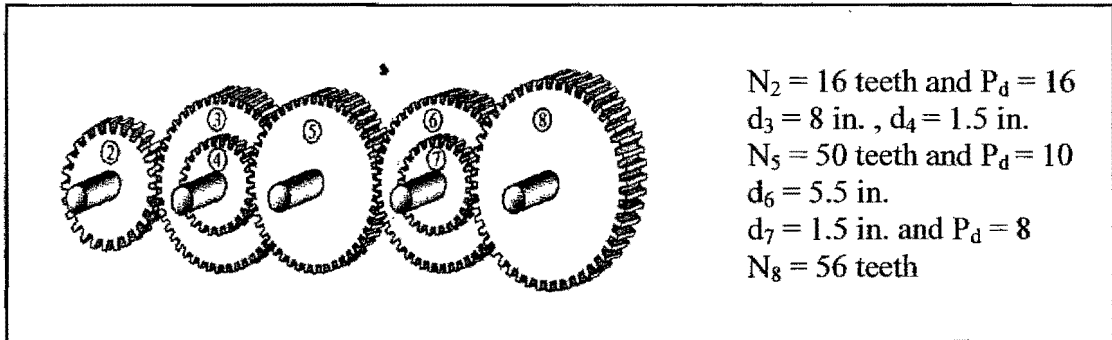


Figure B1

- a) Determine the pitch diameter of gear 2 and diametral pitch of gear 3. [5 marks]
- a) Determine the number of teeth for gear 6 and 7. [5 marks]
- b) Determine the velocity of gear 8 as gear 2 drives at 1200rpm counterclockwise. [5 marks]
- c) Determine the center distance between gears 2 and 8. [5 marks]

B2 The following data are known for spring (Appendix 2):

Material: Music wire (ASTM A228)

Free length = 1.75 in.

Outside diameter = 0.561 in.

Wire diameter = 0.059 in.

The ends are squared and ground

The total number of coils is 10.0

The spring will be used in an application where the normal operating load is to be 14.0 lb. Approximately 300 000 cycles of loading are expected. For this spring, compute the following:

- a) The music wire gage number, mean diameter, inside diameter, spring index and Wahl factor [5 marks]
- b) The pitch and pitch angle [3 marks]
- c) The expected stress at the operating load of 14 lb. [2 marks]
- d) The deflection of the spring under 14 lb. [3 marks]
- e) The operating length and solid length [4 marks]
- f) The force on the spring when it is at its solid length [3 marks]

- B3** Figure B3 (Appendix 3) illustrates the crankshaft of a single cylinder petrol engine. Assume the mass of the shaded portion of the crank web as 0.312 kg and the density of steel as 7800 kg/m^3 .

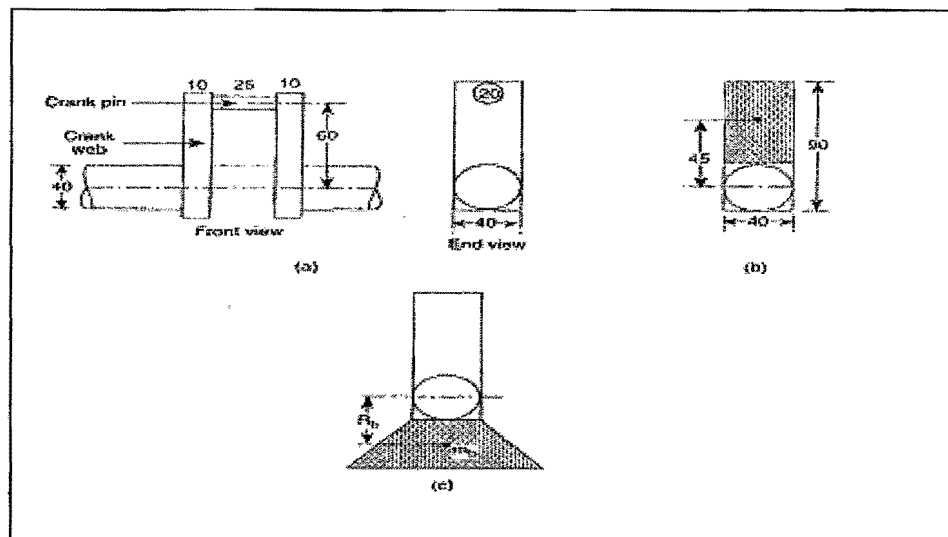


Figure B3: Balancing the crank pin and crank webs: (a) Crank pin and crank webs create an unbalance (b) unbalanced portion of the crank web (c) balance mass

Determine the following:

- The mass of the crank pin. [5 marks]
- The centrifugal force due to the crank pin. [5 marks]
- The centrifugal force due to the crank webs. [5 marks]
- Balance masses required if their centers of gravity are to be at 35mm from the axis of rotation. [5 marks]

- B4** A machine of 100 kg mass is supported on springs of combined stiffness 700 kN/m and has an unbalanced rotating element, which results in a disturbing force of 350 N at a speed of 3000 rpm. Assuming a damping ratio of 0.2, determine

- Its natural frequency of the vibration [3 marks]
- Its frequency of vibration [3 marks]
- Its amplitude of vibration due to unbalance [5 marks]
- The transmitted force [5 marks]
- The transmissibility [4 marks]

APPENDIX 1

DESIGN OF HELICAL COMPRESSION SPRING—METHOD 1			
Specify mean diameter and design stresses. Compute wire diameter and number of coils.			
Enter data for forces and lengths.			
Specify material; shear modulus, G ; and an estimate for design stress.			
Enter trial mean diameter for spring, considering space available.			
Check computed values for spring rate, free length, and new trial wire diameter.			
Enter your choice for wire diameter of a standard size.			
Enter design stress and maximum allowable stress from Figures 19-8 through 19-13 for new D_w .			
Critical values in italics in shaded boxes must be inserted for each problem.			
Initial Input Data:			Comments
Maximum operating force =	$F_o =$	12.0 lb	<i>Note: $F_o = 0$ if $L_f = \text{free length}$</i>
Operating length =	$L_o =$	1.25 in	
Installed force =	$F_i =$	8.0 lb	
Installed length =	$L_i =$	1.75 in	
Trial mean diameter =	$D_m =$	0.60 in	
Type of spring wire =	ASTM A231 steel		
Shear modulus of elasticity of spring wire =	$G =$	1.12E + 07 psi	
Initial estimate of design stress =	$\tau_d =$	130 000 psi	
Computed Values:			
Computed spring rate =	$k =$	8.00 lb/in	
Computed free length =	$L_f =$	2.75 in	
Computed trial wire diameter =	$D_{wt} =$	0.055 in	
Secondary Input Data:			
Standard wire diameter =	$D_w =$	0.0625 in	
Design stress =	$\tau_d =$	145 000 psi	
Maximum allowable stress =	$\tau_{max} =$	170 000 psi	
Computed Values:			
Outside diameter =	$D_o =$	0.663 in	Should not be < 5.0
Inside diameter =	$D_i =$	0.538 in	
Number of active coils =	$N_a =$	12.36	
Spring index =	$C =$	9.60	
Wahl factor =	$K =$	1.15	
Stress at operating force =	$\tau_o =$	86 459 psi	Cannot be $> 145 000$
Solid length =	$L_s =$	0.898 in	Cannot be > 1.25
Force at solid length =	$F_s =$	14.82 lb	Cannot be $> 170 000$
Stress at solid length =	$\tau_s =$	106 768 psi	
Check Buckling, Coil Clearance, and Hole Size:			

Figure A2: Spreadsheet for spring design

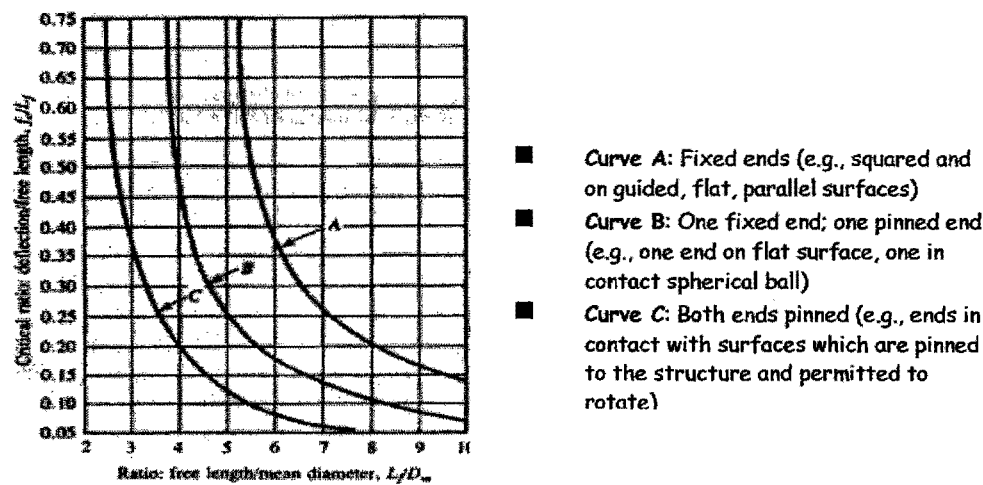


Figure A3: Spring buckling criteria

APPENDIX 2

Table B1: Wire gages and diameters for springs

Gage no.	U.S. Steel Wire Gage (in) ^a	Music Wire Gage (in) ^b	Brown & Sharpe Gage (in) ^c	Preferred metric diameters (mm) ^d
23	0.0258	0.051	0.0226	0.65
24	0.0230	0.055	0.0201	0.60 or 0.55
25	0.0204	0.059	0.0179	0.50 or 0.55
26	0.0181	0.063	0.0159	0.45
27	0.0173	0.067	0.0142	0.45
28	0.0162	0.071	0.0126	0.40
29	0.0150	0.075	0.0113	0.40
30	0.0140	0.080	0.0100	0.35
31	0.0132	0.085	0.00893	0.35
32	0.0128	0.090	0.00795	0.30 or 0.35
33	0.0118	0.095	0.00708	0.30
34	0.0104	0.100	0.00630	0.28
35	0.0095	0.106	0.00501	0.25
36	0.0090	0.112	0.00500	0.22
37	0.0085	0.118	0.00445	0.22
38	0.0080	0.124	0.00396	0.20
39	0.0075	0.130	0.00353	0.20
40	0.0070	0.138	0.00314	0.18

Table B2: Spring wire modulus of elasticity in shear (G) and tension (E)

Material and ASTM no.	Shear modulus, <i>G</i>		Tension modulus, <i>E</i>	
	(psi)	(GPa)	(psi)	(GPa)
Hard-drawn steel: A227	11.5×10^6	79.3	28.6×10^6	197
Music wire: A228	11.85×10^6	81.7	29.0×10^6	200
Oil-tempered: A229	11.2×10^6	77.2	28.5×10^6	196
Chromium-vanadium: A231	11.2×10^6	77.2	28.5×10^6	196
Chromium-silicon: A401	11.2×10^6	77.2	29.5×10^6	203
Stainless steels: A313				
Types 302, 304, 316	10.0×10^6	69.0	28.0×10^6	193
Type 17-7 PH	10.5×10^6	72.4	29.5×10^6	203
Spring brass: B134	5.0×10^6	34.5	15.0×10^6	103
Phosphor bronze: B159	6.0×10^6	41.4	15.0×10^6	103
Beryllium copper: B197	7.0×10^6	48.3	17.0×10^6	117
Monel and K-Monel	9.5×10^6	65.5	26.0×10^6	179
Inconel and Inconel-X	10.5×10^6	72.4	31.0×10^6	214

Note: Data are average values. Slight variations with wire size and treatment may occur.

Table B3: Effect of end conditions and free length conditions

Type of ends	Effect of end conditions	Free length conditions
Squared and ground ends or squared ends	$N_a = N - 2$	$L_f = pN_a + 2d$
Plain ends	$N_a = N$	$L_f = pN_a + d$
Plain coils with ground ends	$N_a = N - 1$	$L_f = p(N_a + 1)$



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Peralatan dan Kawalan
(Instrumentation and Control)

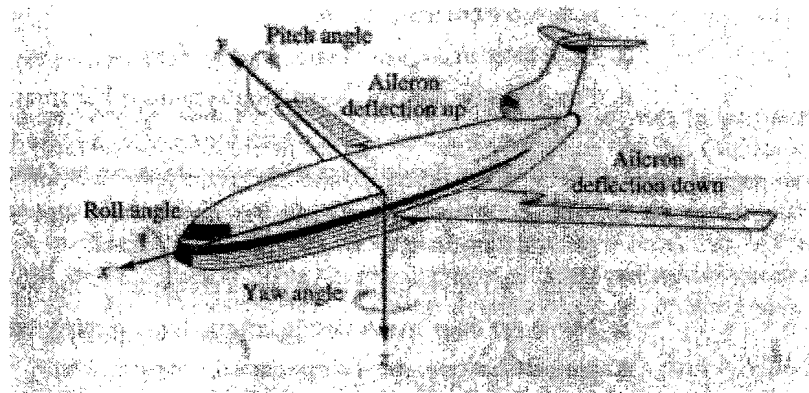
KNJ 3163

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 17 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 11.30 am
Tempat <i>(Place)</i>	: Bilik Seminar 23	Jangkamasa <i>(Duration)</i>	: 2 ½ jam
Pensyarah <i>(Lecturer)</i>	Pn. Shanti Faridah Salleh/Pn. Marini Sawawi		

- Arahan**
(Instruction)
1. **Jawab EMPAT(4) soalan sahaja.**
(Answer FOUR (4) questions only).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

QUESTION 1

An aircraft's attitude varies in roll, pitch and yaw as defined in Figure xx. Draw a functional block diagram for a closed loop system that stabilizes the roll as follows: The system measures the actual roll angle with a gyro and compares the actual roll angle with the desired roll angle. The ailerons respond to the roll-angle error by undergoing an angular deflection. The aircraft responds to this angular deflection, producing a roll angle rate. Identify the input and output transducers, the controller, and the plant. Further, identify the nature of each signal.



(25 marks)

QUESTION 2

A second-order system has an overshoot of 10% and a rise time of 0.4s when subject to a step input. What is:

- (a) the damping ratio, (8 marks)
- (b) the damped angular frequency (8 marks)
- (c) the undamped angular frequency? (9 marks)

QUESTION 3

Briefly explain the measuring instrument elements and describe four (4) characteristics of the instrument that need to be considered before selection is made. (25 marks)

QUESTION 4

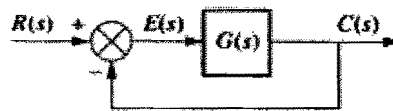


Figure 4.1

- a) Determine whether the unity feedback system of **Figure 4.1** is stable if

$$G(s) = \frac{240}{(s+1)(s+2)(s+3)(s+4)}$$

(15 marks)

- b) For the unity feedback system of **Figure 4.1** with

$$G(s) = \frac{K}{(s+1)^3(s+4)}$$

find the range of K for stability.

(10 marks)

QUESTION 5

For the unity feedback system shown in **Figure 4.1**, where

$$G(s) = \frac{450(s+8)(s+12)(s+15)}{s(s+38)(s^2+2s+28)}$$

find the steady state errors for the following inputs:

- a) $25u(t)$ (9 marks)
- b) $37tu(t)$ (8 marks)
- c) $47t^2u(t)$ (8 marks)



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Pengawasan Keadaan dan Pengurusan Penyelenggaraan
(Condition Monitoring and maintenance Management)

KNJ 4203

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 17 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm-5:00 pm
Tempat <i>(Place)</i>	: Dewan Kuliah 1 (DK1)	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Mohd Shahril Osman		

- Arahan**
(Instruction)
1. **Jawab semua soalan.**
(Answer all questions)
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Question 1

The system shown in Figure 1 is a modeled of a motor with 2 spring which acts as the suspension. The suspension has two spring namely k_s and k_b . Find the natural frequency of the system given that $m = 10$ kg, $k_s = 2000$ N/m and $k_b = 100$ N/m.

[10 marks]

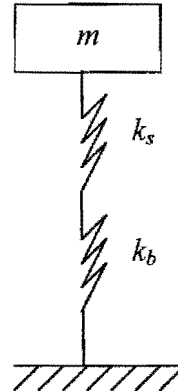
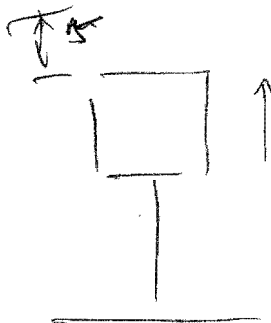


Figure 1

Question 2

An automobile exhibits vertical oscillating displacements of maximum amplitude 5 cm and a measured maximum acceleration of 2000 cm/s^2 . Assuming that the automobile can be modeled as a single-degree-of-freedom system in the vertical direction, calculate the natural frequency of the automobile.

[10 marks]



$$F = kx$$

$$F = ma$$

$$5k = 2000m$$

$$\frac{k}{m} = \frac{2000}{5}$$

$$\sqrt{\frac{k}{m}} \quad \sqrt{\frac{m}{k}}$$

Question 3

a) Explain the following aspects of obtaining a Digital Fourier Transform

i) Aliasing and its prevention

ii) Leakage and its reduction

[10 marks]

b) **Figure 3** shows a graph of displacement against time. The signal is a clean sinusoidal curve. From the graph:

i) Estimate the peak to peak time

ii) Hence, calculate the frequency of the signal

iii) The signal is then Fast Fourier Transform(FFT), sketch the FFT against time. Indicate the peak of the FFT.

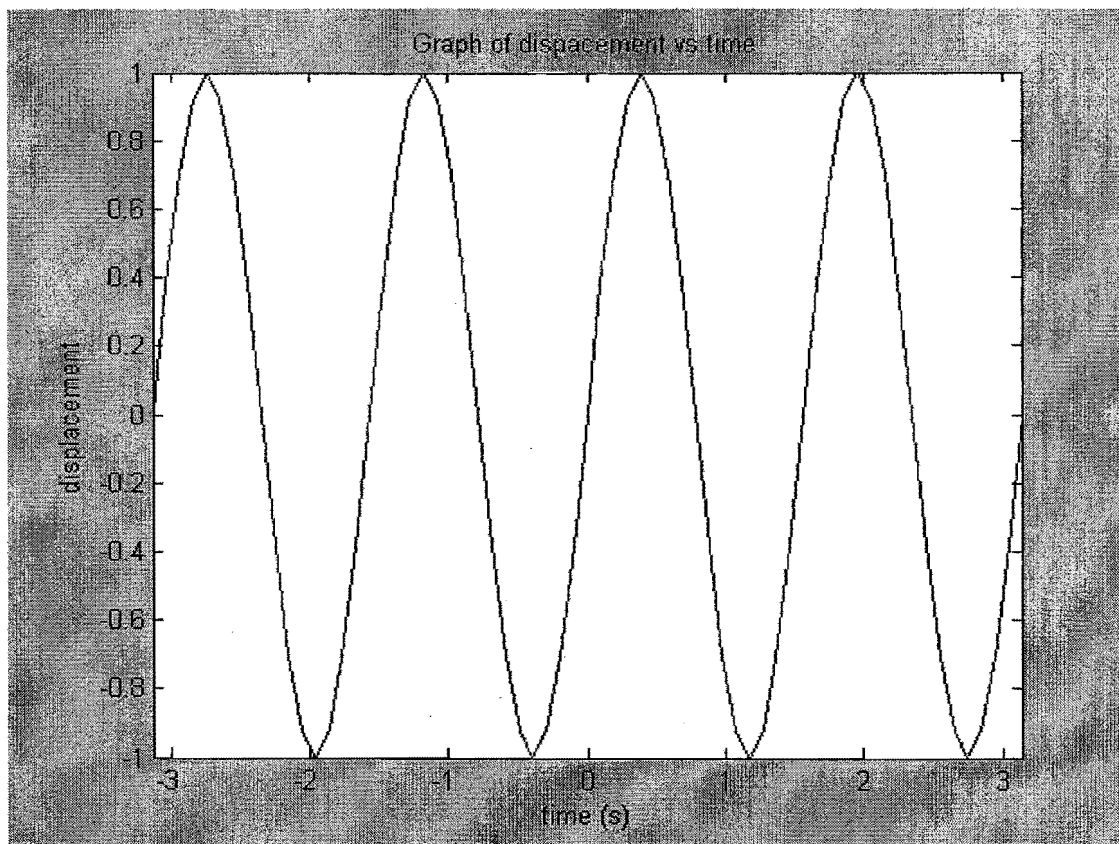


Figure 3

[15 marks]

Question 4

A measurement of noise has the following octave band values

Centre Frequency (Hz)	125	250	500	1k	2k	4k	8k
Band Level (dB SPL)	53	51	50	56	59	55	54

Calculate

a) The overall dB SPL.

b) The RMS sound pressure in Pascals.

c) Comments why in a) the increase in dB is not significant

$\frac{u}{f}$

$$(L_p = 20 \log_{10} \left(\frac{P_{rms}}{P_0} \right)); P_0 = 20 \times 10^{-6})$$

$$PL = SPL - 10$$

[10 marks]

Question 5

Give three reasons why maintenance is important in one organisations.

How do you Estimate and Measure Maintenance cost?

Give examples how costing is important in maintaining an equipment.

[15 marks]

Charlie

Question 6

Figure 2 shows a model for a two degree of freedom in free vibrations. The system is set to model a shear structure. The system has 2 mass supported by columns from the ground. The first mass, m_1 has the mass of 3000 kg supported on light columns from the ground of total shear stiffness 40MN/m. The second mass, m_2 is 2000 kg on a light column of 30MN/m. Calculate the natural frequencies and the normal modes.

[15 marks]

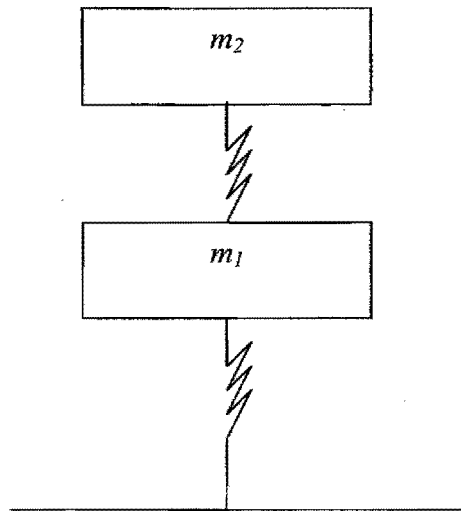


Figure 2

Question 7

A resiliently mounted machine of total 90 kg undergoes vertical oscillations in response to the rotation of an unbalanced internal rotor. The rotor unbalance is 0.02kgm and the rotation is at 1800 rpm. Calculate:

- The spring stiffness required to reduce the machine vibration to zero at the operating speed.
- The absorber mass vibration amplitude.

[15 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

SISTEM KAWALAN PROSES
(PROCESS CONTROL SYSTEMS)

KNJ 4183

Peperiksaan (Examination)	: Akhir	Tarikh (Date)	: 18 November 2005
Semester	: 1 Sesi 2005/2006	Masa (Time)	: 9.00 am – 11.30 am
Tempat (Place)	: Bilik Seminar 23	Jangkamasa (Duration)	: 2.5 jam
Pensyarah (Lecturer)	: Pn. Marini Sawawi		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan Bahagian A dan DUA (2) soalan Bahagian B.**
(Answer ALL questions in Section A and TWO(2) questions in Section B).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

SECTION A (60%)

Answer all questions in this section

Question 1

A plant has transfer function of

$$\frac{1}{s(s^2 + 3s + 5)} \dots\dots [1.1]$$

and a unity feedback.

What will be the steady state error with a unit ramp input if

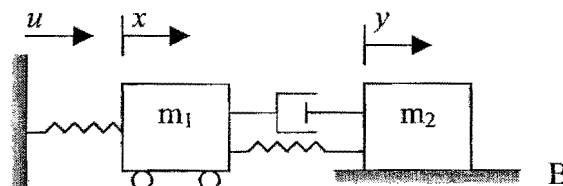
- a) a proportional controller with a gain 4 is introduced into the forward path. (10 marks)
- b) an integral controller with time constant 2s is used instead of the proportional controller? (10 marks)

Question 2

Derive the mathematical relationship of the system below and obtain the transfer function

by using block diagram manipulation method. Assume the friction force, $F_B = B \frac{dy}{dt}$.

(20 marks)



Question 3

A second order system has a natural angular frequency of 2.0Hz and a damped frequency of 1.8Hz. Determine the following:

- a) damping factor (5 marks)
- b) 100% rise time (5 marks)
- c) the percentage of maximum overshoot (5 marks)
- d) the 2% settling time (5 marks)

SECTION B (40%)

Answer TWO (2) questions in this section



1. Cascade control is one of the advanced control strategy for a single loop system. Provide example for this type of control systems and describe it in details.

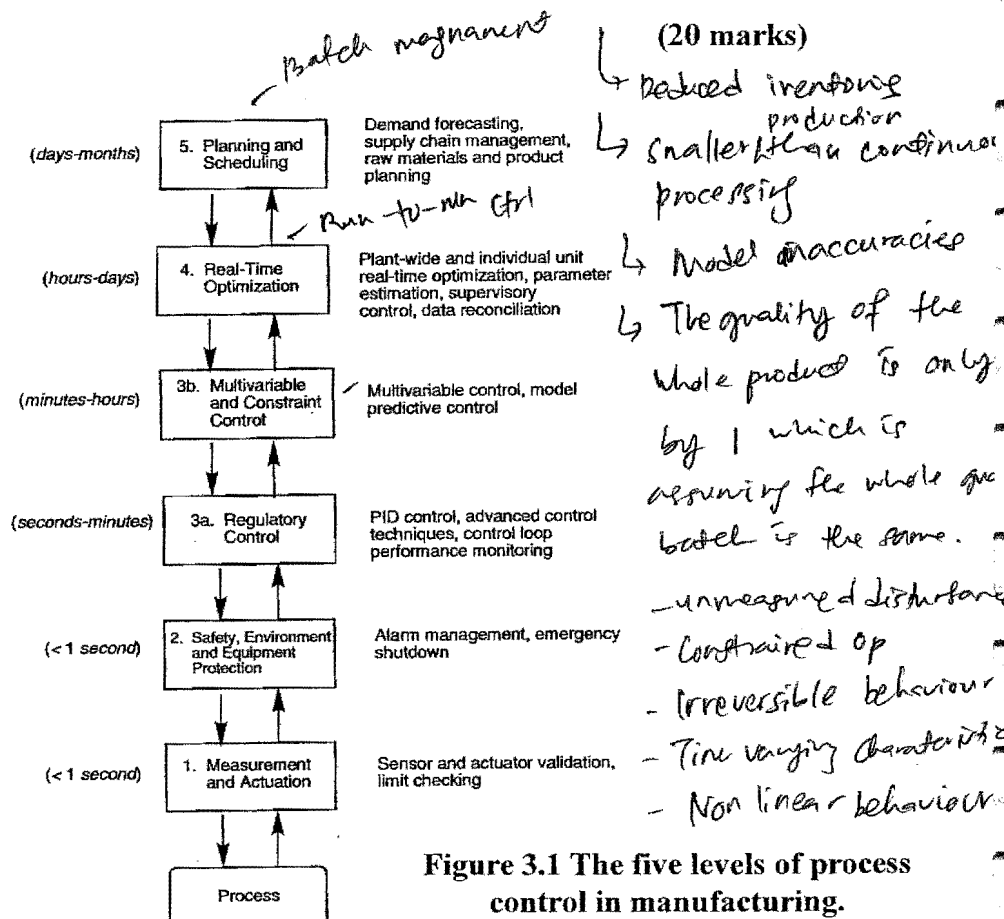
(20 marks)

2. Typically, practical problems involve a number of variables that must be controlled and a number of variables that can be manipulated. These problems are referred to multiple input and multiple output (MIMO) control problems. Explain the conventional method for controlling a multiloop system and its drawback. Suggest the solution with appropriate example.

(20 marks)

3. Describe the batch control system that operate at various level of plant control as in Figure 3.1. Then, briefly explain the advantages and disadvantages of batch processing.

(20 marks)





UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Tenaga Pembuatan
(Energy for Manufacturing)

KNP 3043

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 11 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.30 pm – 5.30 pm
Tempat <i>(Place)</i>	: Bilik Seminar 12	Jangkamasa <i>(Duration)</i>	: 3 JAM
Pensyarah <i>(Lecturer)</i>	: Dr. Mohammad Omar Abdullah		

- Arahan**
(Instruction)
1. **Jawab mana-mana TIGA (3) soalan di Bahagian 1 dan jawab SEMUA soalan di Bahagian 2.**
(Answer any THREE (3) questions in Section 1 and answer ALL questions in Section 2).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen)
 4. **Serahkan kertas jawapan berasingan untuk kedua-dua seksyen tersebut.**
(Submit the answer scripts separately for both sections)
 5. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 6. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Answer any THREE (3) questions in Section 1 and answer ALL questions in Section 2.

Part 1 (Answer any 3 questions)

Question 1.

- (a) Describe two of the factors contributing to cost advantages and better energy use by the Japanese manufacturers compared to the UK and US manufactures. [3 %]
- (b) With the aid of diagram(s), discuss the following energy-saving systems. Also, give examples of applications.
- (i) run-around-coil system. [6 %]
- (ii) heat-pipe & heat-pipe heat exchanger. [6 %]

Question 2.

- (a) List 3 advantages of hydro-power. [3 %]
- (b) Draw a schematic diagram of a PEM fuel cell and briefly describe how a PEM fuel cell works by means of energy conversion. Also, list the equations governing the process. [7 %]
- (c) List three losses that can affect the efficiency of a fuel cell. [3 %]
- (d) What is the total useful energy from the fuel cell reaction to make electricity? Express it in mathematical form, as a functions of entropy and enthalpy. [2 %]

Question 3.

- (a) In a wind energy power plant, wind turbines convert the kinetic energy in the wind into mechanical power. Briefly describe the functions of the following component in a typical wind energy plant.
- (i) controller [3 %]
- (ii) gear box. [3 %]
- (iii) wind vane. [3 %]
- (b) There are two kinds of nuclear power plants system, i.e. boiling water reactors and pressurized water reactors.
- (i) Draw the schematic diagram of a typical pressurized water reactors system. [3 %]
- (ii) Briefly describe how it works. [3 %]

Question 4

- (a) Name 2 differences between combustion turbines and microturbines. [3%]
- (b) Figure 1 below illustrates a microturbine turbo generator. It is able to operate on a variety of fuel types: natural gas, biogas, diesel fuel, kerosene or propane.
- (i) Explain the functions of the diffuser. [3 %]
- (ii) Draw a system block diagram showing the key elements of an electronically controlled microturbine system. [3 %]

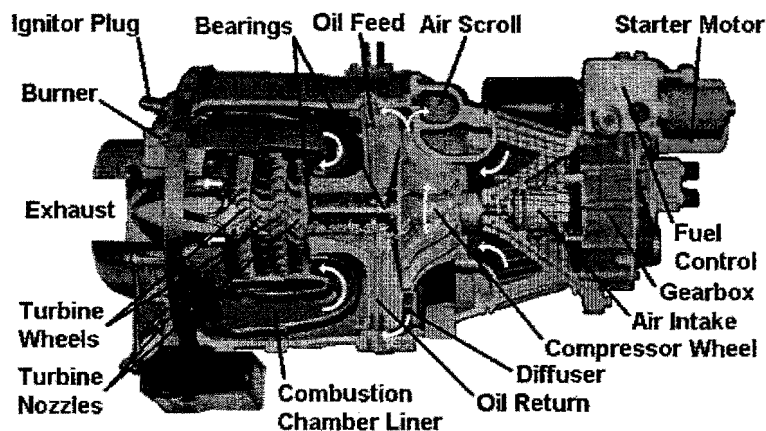


Fig. 1. Microturbine turbo generator

- (c) A typical traditional and MicroCHP system are providing 120 kW of hot water and 60 kW of electricity, and the energy flows are shown in the Sankey diagrams below. Compare the differences for both systems in relation to
- (i) Energy efficiency; and [3 %]
- (ii) Percentage of fuel input requirement. [3 %]

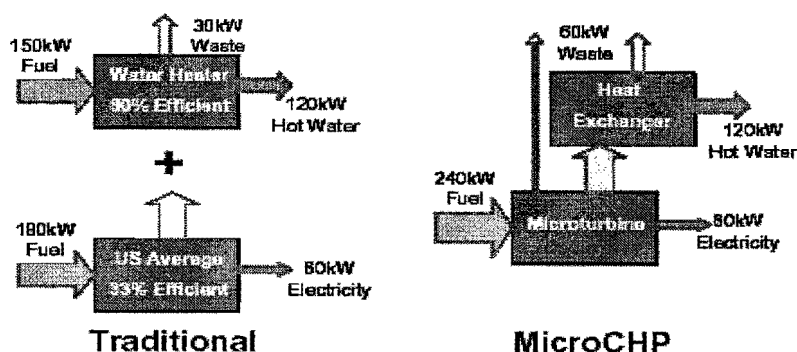


Fig. 2. Traditional vs MicroCHP system

Part II (Answer all questions in this section)

Question 5.

- (a) Combined heat and power (CHP) plant is one of the energy-saving systems. Draw a schematic diagram for a typical Micro-CHP system using automotive engine adapted to run on natural gas, and briefly discuss the system. [7 %]
- (b) A particular smoked fish factory has an electrical demand of 100 kW and a heat requirement of 190kW which is currently supplied using power from the conventional grid and a boiler burning gas with an efficiency of 80%. For the new design, it is proposed to install a micro-CHP system of two gas engines each producing 40 kW electrical power and a heat output of 95 kW; the overall efficiency of the each engine is 90%. Under the new system the excess power requirements will be met from the grid. Assuming that the cost of electricity is four times that of natural gas, calculate:
- (i) the energy equivalent cost (in kW) for the existing system. [4 %]
 - (ii) the energy equivalent cost (in kW) for the new system. [4 %]
 - (iii) the percentage saving in fuel cost in changing to the new system. [3 %]

Question 6

- (a) Draw a schematic diagram of an *open-cycle gas-steam* combined power plant and explain briefly how it could be used for energy recovery. [7 %]
- (b) A combined power plant consists of a gas turbine unit and a steam turbine unit. The exhaust gas from the open-cycle gas turbine is the supply gas to the steam generator of the steam turbine cycle at which additional fuel is burned in the gas. The pressure ratio for the turbine is 7.5, the air inlet temperature is 15 °C, and the maximum cycle temperature is 750 °C. Combustion in the steam generator raises the gas temperature to 750 °C and the gas leaves the generator to the chimney at 100 °C. Steam is supplied to the steam turbine at 50 bar, 600 °C, and the condenser pressure is 0.1 bar. The isentropic efficiencies of the air compressor, gas turbine, and steam turbine are 83%, 86% and 85% respectively.
- Take the c_p and γ of the combustion gases as 1.11 kJ/kg.K and 1.33 for the combustion gases, and neglecting the effect of mass flow rate of fuel, feed-pump work, and all pressure losses. Calculate:
- i) The required flow rates of air and steam for a total power output of 200 MW. [10 %]
 - ii) The power output of each unit. [10 %]
 - iii) The overall energy efficiency of the plant. [10 %]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Robotik dan Pengautomatan
(Robotics and Automation)

KNP 4063

Peperiksaan <i>(Examination)</i>	: Peperiksaan Akhir	Tarikh <i>(Date)</i>	: 15 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 – 11.30 am
Tempat <i>(Place)</i>	: Dewan Kuliah 1	Jangkamasa <i>(Duration)</i>	: 2 jam 30 minit
Pensyarah <i>(Lecturer)</i>	: En. A.Rahim Md.Amin		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer any ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Answer ALL Questions

Question 1

- a. What is a PLC? [3 marks]
- b. List down the functions of a PLC. [6 marks]
- c. Why PLC are not like computers? [6 marks]
- d. List and briefly discuss five advantages of a PLC. [10 marks]

Question 2

- a. You are to implement a robot to perform spray painting of complex shape and another robot to perform spot welding operation. Discuss the type of control that you may use in each case. [6 marks]
- b. Now you are ready to order the robots for the task in (a), but before that you need to list the performance specification of the robots to the supplier. Discuss what you need to mention. [6 marks]
- c. Describe various degrees of freedom in an articulating robot. [9 marks]
- d. Discuss a special variation of an articulating robot called SCARA. [4 marks]

Question 3

- a. Briefly explain what do you understand by machine vision system. [2 marks]
- b. Briefly discuss three applications of machine vision in manufacturing industry. [6 marks]
- c. Discuss two factors that determine the quality of the images reproduced by machine vision system. [4 marks]
- d. Lighting is an important element in image acquisition system and play important role in the success of the system. [6 marks]
- e. Edge detection is one of the techniques used to analyze the images captured. Explain how does this technique work? [7 marks]

Question 4

- a. What is the function of a sensor in automated manufacturing? Limit switches, proximity switches, and infrared sensors are examples of commonly used sensors in manufacturing. Describe the function of these sensors. **[9 marks]**
- b. What is the function of an analyzer? Give four examples of analyzers and briefly explain their functions. **[5 marks]**
- c. What is the function of actuators? Describe the functions of a cylinder and solenoid. **[6 marks]**
- d. What is the function of a drive? Describe two types of electric motors used as a drive. **[5 marks]**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Sistem Pembuatan Lanjutan
(Advanced Manufacturing Systems)

KNP 4073

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 16 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: Dewan Kuliah I	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Magdalene Andrew Munot		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan dari Bahagian A dan DUA (2) soalan dari Bahagian B.**
(Answer ALL questions from Section A and TWO (2) questions from Section B).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

SECTION A [50 Marks]

ANSWER ALL QUESTIONS

1. CAD/CAM is NOT an enabling technology for Concurrent Engineering.
True / False [1 mark]
2. A critical issue for concurrent working is task visibility – who is doing what, how far it has progresses, when it is required and what needs to be done next.
True / False [1 mark]
3. With concurrent engineering approach it is essential when making decisions to move on to the next stage, ensuring that it is taken into account that you are committing not only to the design but also to the planning and tooling.
True / False [1 mark]
4. The design engineering and manufacturing engineering functions are normally separated in the traditional approach to product development.
True / False [1 mark]
5. The objective of design for product cost (DFC) is to identify how design decisions influence product costs and to develop ways to reduce cost through product quality.
True / False [1 mark]
6. A generative CAPP system generates a new process plan by modifying an existing process plan to accommodate for differences in the two parts.
True / False [1 mark]
7. Generally RP methods produce faster and more accurate tools when compared to tools produced using Computer Numerical Control (CNC) machining.
True / False [1 mark]
8. In on-line programming of a CMM, the program is prepared off-line based on the part drawing and then download to the CMM controller for execution.
True / False [1 mark]

9. Which of the following statement is NOT a feature of an integrated CAD/CAM, production scheduling and control system. **[1 mark]**
- a. If a change is made to the design model, the tool path will automatically update itself.
 - b. Modifications of one part and any related parts should be automatically generated by following the predetermined internal relationship among the interdependent parts.
 - c. A new formulation or modification of existing CAD data to meet the new order is necessary.
 - d. The system is a distributed architecture with a high degree of flexibility, modularity, and modifiability; there, a centralized scheduling is not permissible.
10. One of the following statements concerning the benefits of computer aided process planning is TRUE. **[1 mark]**
- a. The CAPP program can be interfaced with other application programs such as cost estimating.
 - b. The computer prepared route sheets are complex and difficult to read.
 - c. The computer prepared process plans are often complicated and conflicting.
 - d. The process planner often takes a longer time to prepare the route sheet due to its complexity.
11. Which of the following statements concerning factors for Design for life cycle is FALSE?. **[1 mark]**
- a. Ease and convenience of use.
 - b. Transport cost and time to deliver.
 - c. Manufacturing time and cost.
 - d. Utility requirements and support during installation.

12. Typical CAM applications for manufacturing planning are:

[1 mark]

- a. Computer aided line balancing, process control, cost estimating, CAPP and process monitoring.
- b. Computerized machinability data systems, computer assisted NC part programming development of work standards and production and inventory planning.
- c. Shop floor control, process control, production and inventory planning and cost estimating.
- d. All of the above.

13. Which of the following statements concerning Design for Manufacturing and Assembly (DFMA) is TRUE?

[1 mark]

- a. An approach used in product development in which the functions of design engineering, manufacturing engineering and others are integrated.
- b. Relies on the use of design principles and guidelines to design a product to minimized manufacturability and assemblability.
- c. The objective is to design a product so that its function and performance are relatively
- d. Effective implementation involves making changes in a company's organizational structure.

14. Which of the following statements concerning the benefits of using CMM over manual inspection is TRUE?

[1 mark]

- a. All measurements can be made in a multiple setups
- b. All measurements can be done on-line.
- c. Inspection of a variety of part configurations with minimal changeover time.
- d. 100% inspection can be done for all parts.

15. Which of the following statements concerning the characteristic of processes suitable for CMM application is FALSE? [1 mark]

- a. Low variety of parts to be inspected.
- b. Parts to be inspected have complex geometry.
- c. High variety of parts to be inspected.
- d. Require multiple contact points for measuring the part geometry.

16. Identify and choose the correct tasks sequence performed by a cell controller in a flexible manufacturing cell (FMC) whenever a part arrives at the input buffer.

[2 mark]

- I. The cell controller transfers the NC code of this part from the common database to the NC controller.
 - II. Start the machine; stop machine.
 - III. Check whether the machine is idle or not.
 - IV. The cell controller makes the decision according to the production data recorder in the barcode.
 - V. If there are multiple jobs in the buffer, the cell controller will make a real-time decision to load the selected next part on to the machine.
 - VI. The job's position in the buffer is notified to the cell controller whenever the part arrives at the input buffer.
 - VII. The cell controller drives the pallet to the correct position where the robot can capture the part.
 - VIII. If the machine is idle, the cell controller will verify whether there are multiple parts in the buffer or not.
- a. II, III, IV, V, I, VI, VIII, VII
 - b. VI, VIII, V, IV, VII, I, II, III
 - c. III, VIII, I, V, IV, II, VI, VII
 - d. II, VIII, V, IV, I, VI, VII, III

17. Which of the following statements concerning the factor for considering the application of rapid prototyping parts is NOT important? [1 mark]
- Manufacturing lead time and cost of part.
 - Final application of part.
 - Production volume of part.
 - Part size and accuracy.
18. Identify and choose the correct sequence for activities performed using the CAD/CAM system. [2 marks]
- Design analysis.
 - Coding and classification.
 - Shop floor.
 - Jig and tool design.
 - Parts listing.
 - Process planning.
 - Original design.
 - NC programming.
- VI, VII, I, IV, V, II, III, VIII
 - V, IV, II, VI, VIII, III, VII, I
 - VII, I, V, II, VI, IV, VIII, III
 - VII, V, I, IV, V, II, III, VIII,
19. Which of the following statements concerning rapid prototyping (RP) is TRUE? [1 mark]
- RP can be used for producing several small prototypes inexpensively.
 - RP can allow the designer to have a physical representation that demonstrates the product's use and functions.
 - RP can be use for preliminary prototyping fabrication.
 - All of the above.

20. The main reason for rapid prototyping a product:

[1 mark]

- a. High capital cost.
- b. Long time to prepare production tooling.
- c. Rapid manufacturability and design effectiveness.
- d. All of the above.

21. Match the various types of coordinate measuring machines (CMM) **Table 1** against its characteristic in **Table 2**. There are more items in **Table 2** than in **Table 1**.

[5 marks]

Table 1: Types of CMM	
A.	Horizontal Arm
B.	Cantilever
C.	Fixed bridge
D.	Column
E.	Moving bridge

Table 2: Characteristics of CMM	
I.	Advantages of this construction are convenient access to the worktable and high throughput.
II.	In the construction, the worktable is moved to achieve motion in the x-axis and y-axis.
III.	This type of construction is commonly used in the industry.
IV.	This construction allows motion in the y-axis and z-axis motion.
V.	This type of construction typically use for large objects.
VI.	This construction eliminates the possibility of yawning and hence increasing rigidity and accuracy.

22. Match the numerous rapid prototyping techniques (RP) Table 1 against its characteristic in Table 2. There are more items in Table 2 than in Table 1.

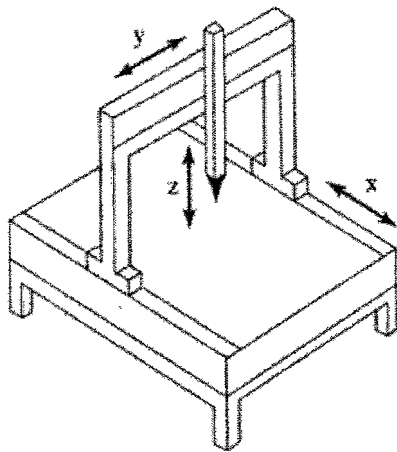
[6 mark]

Table 1: Types of RP technique	
A.	Laminated object manufacturing
B.	Fused deposition modeling
C.	Solid ground curing
D.	Selective laser sintering
E.	Stereolithography
F.	3-D Jet Printing
G.	

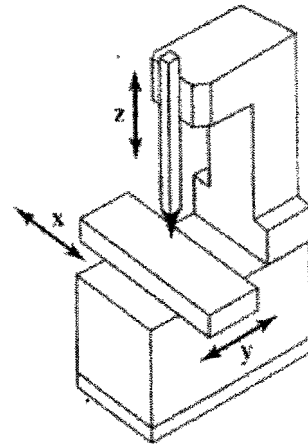
Table 2: Characteristics of CMM	
I.	This technique involves building 3D models from liquid photosensitive polymers which harden when exposed to ultraviolet light.
II.	This technique involves a feeder/controller mechanism that move the sheet over the build platform, in which a base has been created from paper and double sided foam tape.
III.	This technique involves printing a photomask of the layer to be built on a glass plate above the build platform using an electrostatic process.
IV.	This technique involves a controlled extrusion depositing very thin beads of material on the build platform to form layers of thermoplastics.
V.	This technique involves removing green parts unbound powder and blowing off excess unbound powder.
VI.	This technique involves building parts on a platform that sits just below the surface in a bin of the heat-fusible powder.
VII.	This technique involves uses a UV beam to selectively fuse powdered materials such as nylon, elastomer and metal into a solid object.

23. Specify the type of coordinate measuring machines shown in Figure 1(a) to (f)

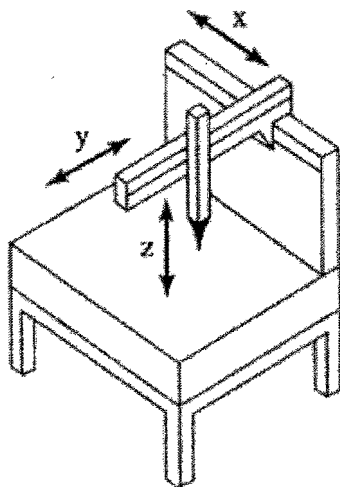
[6 mark]



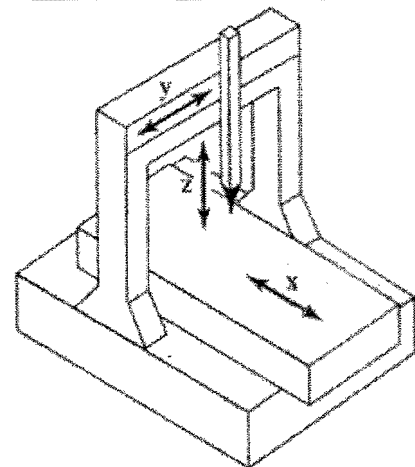
1(a)



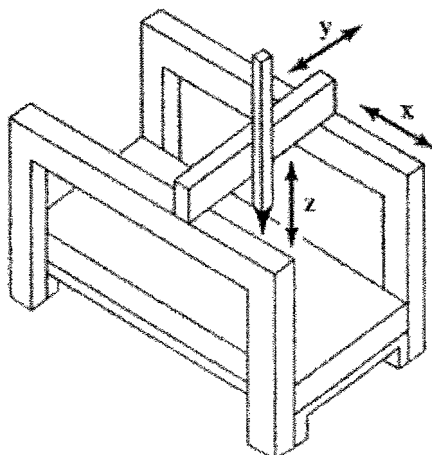
1(b)



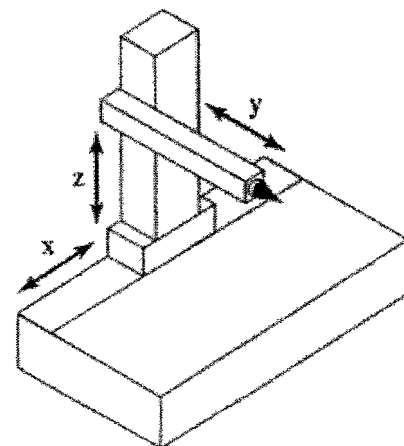
1(c)



1(d)



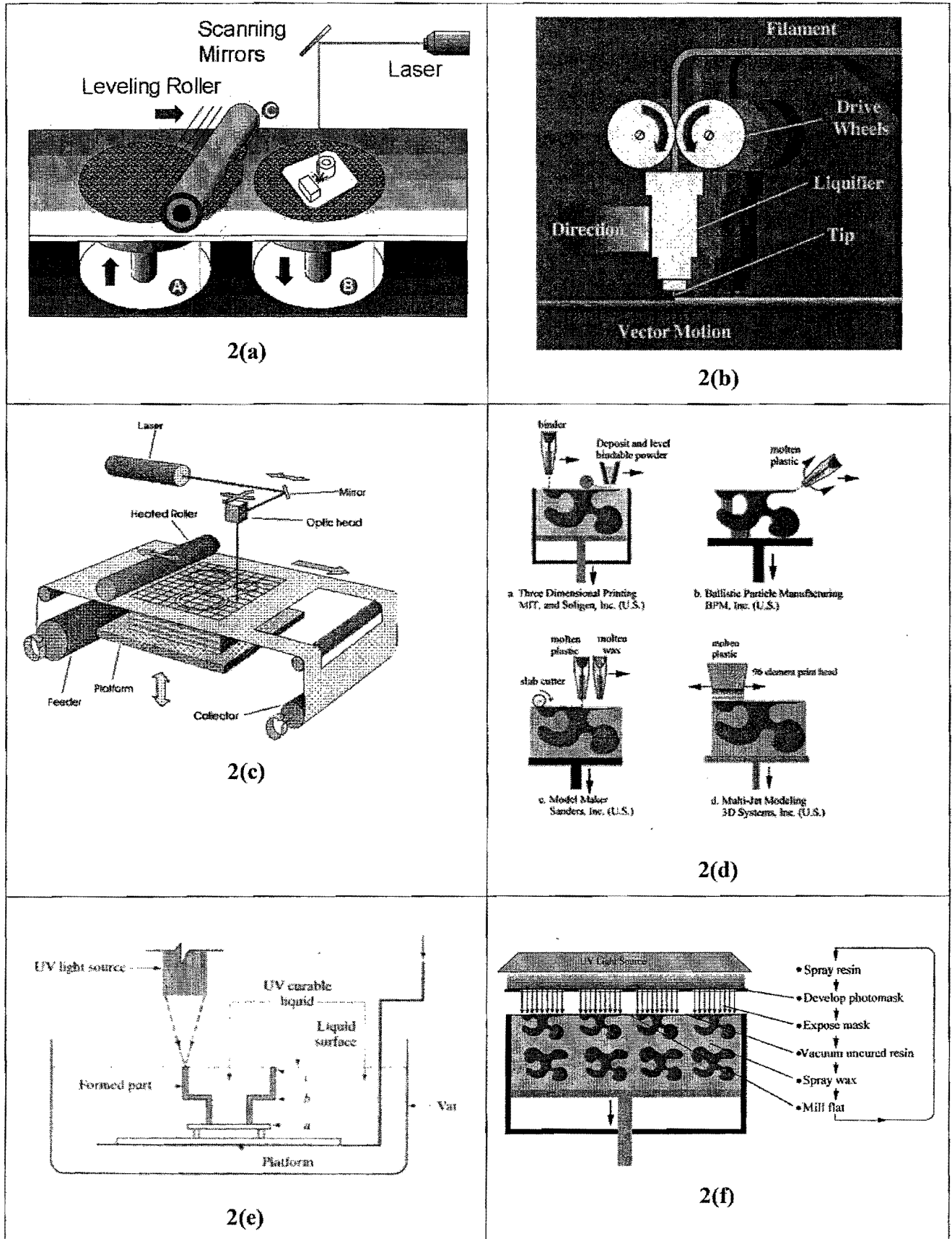
1(e)



1(f)

24. Specify the type of rapid prototyping (RP) machines shown in Figure 2(a) to (f)

[6 mark]



25. The part dimension L in Figure 3 is to be measured. The dimension is aligned with the x -axis, so it can be measured using only x -coordinate locations. When the probe is moved toward the part from the left, contact made at $x=71.93$ is recorded (mm). When the probe is moved toward the opposite side of the part from the right, contact made at $x=132.34$ is recorded. The probe tip diameter is 3.00 mm. What is the dimension L ? [3 marks]

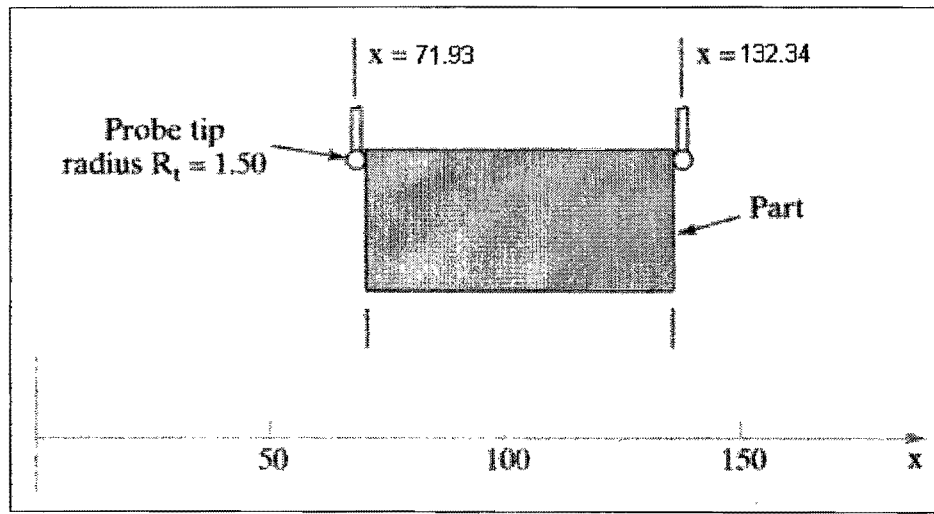


Figure 3

26. Draw and label the configuration of a typical CAD system.

[2 marks]

SECTION B [50 Marks]

ANSWER ANY TWO (2) QUESTIONS

Question 1

[25 marks]

- Define automated inspection.
- List and describe four (4) types of CMM software required to operate the CMM and its associated equipment.
- Discuss three (3) methods for operating and controlling a coordinate measuring machine (CMM).
- Briefly discuss two (2) factors that greatly influence the future development of CAD/CAM system.

[25 marks]

Question 2

- Describe the basic five steps process for rapid prototyping (RP).
- Referring to the **Case Study 1**, describe **10 recommendations** how to use concurrent engineering to resolve the design problem
- Briefly discuss three (3) motivations for applying Concurrent Engineering approach to product development.

Case Study 1

Engineers of company A prepared plans and specifications for machinery to be used in a manufacturing process, and Company A turned then over to Company B for production. The engineers of Company B in reviewing the plans and specifications came to the conclusion that they included certain miscalculations and technical deficiencies of a nature that the final product might be unsuitable for the purposes of the ultimate users, and that the equipment, if built according to the original plans and specifications, might endanger the lives of persons in proximity to it. The engineers of Company B called the matter to the attention of appropriate officials of their employer who, in turn, advised Company A of the concern expressed by the engineers of Company B. Company A replied that its engineers believed that the design and specifications for the equipment were adequate and safe and that Company B should proceed to build the equipment as designed and specified. The officials of Company B instructed its engineers to proceed with the work.

Question 3

[25 marks]

- Draw a flow diagram showing the general procedures for a Retrieval CAPP system.
- Describe the Stereolithography technique of rapid prototyping (RP).
- Discuss three (3) factors that would improve the future developments of RP.



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN

(Faculty of Engineering)

Kejuruteraan Bahan II

(Engineering Materials II)

KNJ 2112

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 16 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm - 5.00 pm
Tempat <i>(Place)</i>	: BS 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Puan Mahshuri Yusof		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1 [25 marks]

- a. Define metal creep [2 marks]
- b. For which environmental conditions is the creep of metal especially important industrially? [2 marks]
- c. Draw a typical creep curve for a metal under constant load and at a relatively high temperature, and indicate on it all three stages of creep. Describe what occurs metallurgically at each stage of creep [11 marks]
- d. What is the minimum creep rate with respect to the creep curve? [2 marks]
- e. The following creep data were obtained for a titanium alloy at 50 ksi and 400°C. Plot the creep curve and determine the steady-state creep rate for these test conditions. [8 marks]

Strain, in/in	Time, h	Strain, in/in	Time, h
0.010×10^{-2}	2	0.075×10^{-2}	80
0.030×10^{-2}	18	0.090×10^{-2}	120
0.050×10^{-2}	40	0.11×10^{-2}	180

Question 2

- a. Describe a metal fatigue failure [1 mark]
- b. Where do fatigue failures usually originate on a metal section? [2 marks]
- c. What is a fatigue test SN curve, and how are the data for the SN curve obtained? [5 marks]
- d. A fatigue test was conducted in which the mean stress was 70 MPa and the stress amplitude was 210 MPa. [2 marks]
- (i) Compute the maximum and minimum stress levels [2 marks]
- (ii) Compute the stress ratio [2 marks]
- (iii) Compute the magnitude of the stress range. [2 marks]
- e. The fatigue data for a steel alloy are given as follows:

Stress Amplitude [MPa]	Cycles to Failure
470	10^4
440	3×10^4
390	10^5
350	3×10^5
310	10^6
290	3×10^6
290	10^7
290	10^8

- (i) Make an S-N plot using these data [5 marks]
- (ii) What is the fatigue limit for this alloy? [2 marks]
- (iii) Determine fatigue lifetimes at stress amplitudes of 415 MPa and 275 MPa. [2 marks]
- (iv) Estimate fatigue strengths at 2×10^4 and 6×10^5 cycles. [2 marks]

Question 3

- a. Nitrogen from a gaseous phase is to be diffused into pure iron at 700°C. If the surface concentration is maintained at 0.1 wt% N, what will be the concentration 1 mm from the surface after 10 h? The diffusion coefficient for nitrogen in iron at 700 °C is $2.5 \times 10^{-11} \text{ m}^2/\text{s}$. [10 marks]
- b. Using the isothermal transformation diagram for an iron-carbon alloy of eutectoid composition as shown in the figure below, specify the nature of the final microstructure (in terms of microconstituents present and approximate percentages of each) of a small specimen that has been subjected to the following time-temperature treatments. In each case assume that the specimen begins at 760 °C (1400 °F) and that t has been held at this temperature long enough to have achieved a complete and homogeneous austenite structure. (Refer Fig 1)
- (i) Cool rapidly to 700 °C (1290 °F), hold for 10^4 s, and then quench to room temperature. [2 marks]
 - (ii) Reheat the specimen in part (a) to 700 °C (1290 °F) for 20 h. [2 marks]
 - (iii) Rapidly cool to 600 °C (1110 °F), hold for 4 s, rapidly cool to 450 °C (840 °F), hold for 10 s, then quench to room temperature [2 marks]
 - (iv) Cool rapidly to 400 °C (750 °F), hold for 2 s, then quench to room temperature [2 marks]
 - (v) Cool rapidly to 400 °C (750 °F), hold for 20 s, then quench to room temperature. [2 marks]
 - (vi) Cool rapidly to 400 °C (750 °F), hold for 200 s, then quench to room temperature. [2 marks]
 - (vii) Rapidly cool to 575 °C (1065 °F), hold for 20s, rapidly cool to 350 °C (660 °F), hold for 100 s, then quench to room temperature. [2 marks]
 - (viii) Rapidly cool to 250 °C (480 °F), hold for 100 s, then quench to room temperature in water. Reheat to 315 °C (600 °F) for 1 h and slowly cool to room temperature. [2 marks]
- c. A sample of zinc corrodes uniformly with a current density of $4.27 \times 10^{-7} \text{ A/cm}^2$ in an aqueous solution. What is the corrosion rate of the zinc in milligrams per decimeter per day (mdd)? The reaction for the oxidation of zinc is $\text{Zn} \rightarrow \text{Zn}^{2+} + 2e^-$. ($M=65.38 \text{ g/mol}$ for Zn, Faraday's constant= $96,500 \text{ C/mol}$ or $96,500 \text{ A.s/mol}$) [5 marks]
- d. What is non-destructive technique and list when NDT is usually applied [4 marks]

Question 4

- a. Equiaxed MAR-M 247 alloy is to support a stress of 276 MPa. Determine [10 marks]
the time in hour to stress rupture at 850 °C. Refer Figure 2 in Appendix
- b. DS MAR-M 247 alloy is to support a stress of 207 MPa. At what [5 marks]
temperature (°C), will the stress rupture lifetime be 210 h? Refer Figure 2
in Appendix
- c. If DS CM 247 LC alloy is subjected to a temperature of 960 °C for 3
years, what is the maximum stress that it can support without rupturing? [5 marks]
Refer Figure 2 in Appendix

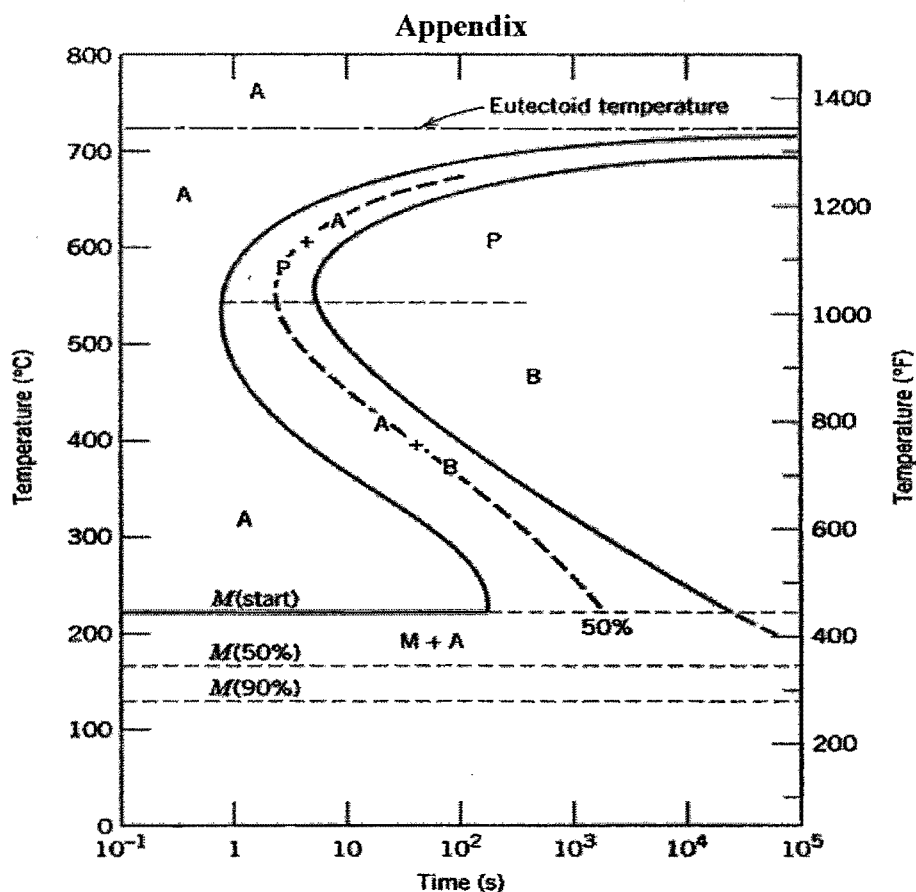


Figure 1: The complete isothermal transformation diagram for an iron-carbon alloy of eutectoid composition: A (Austenite); B (Bainite), M (Martensite), P (Pearlite)

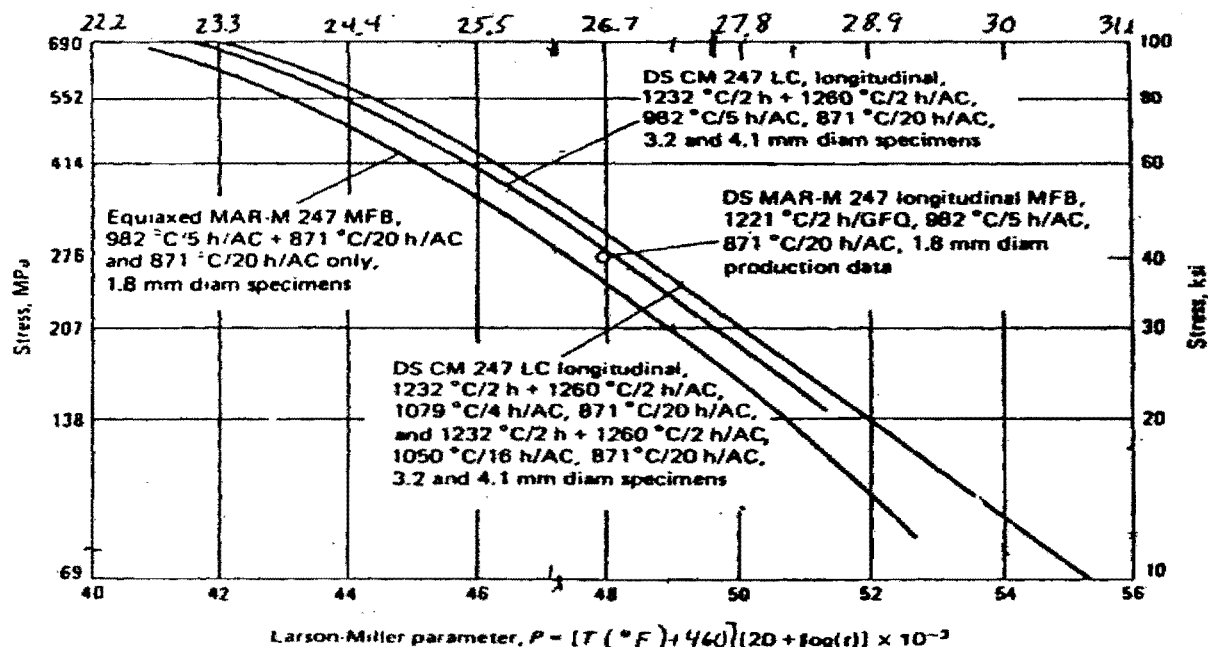


Figure 2: Larsen-Miller stress-rupture strength of directionally solidified (DS) CM 247 LC alloy vs DS and equiaxed MAR-M 247 alloy. MFB: Machined From Blade, GFQ: Gas Fan Quenches, AC: Air cooled [Hint: $P = T(K) \log t_r + 20$, Larson-Miller Parameter must be $\times 1000$)]

Table 1: Tabulation of Error Function Values

z	erf(z)	Z	erf(z)	z	erf(z)
0	0	0.55	0.5633	1.3	0.9340
0.025	0.0282	0.60	0.6039	1.4	0.9523
0.05	0.0564	0.65	0.6420	1.5	0.9661
0.10	0.1125	0.70	0.6778	1.6	0.9763
0.15	0.1680	0.75	0.7112	1.7	0.9838
0.20	0.2227	0.80	0.7421	1.8	0.9891
0.25	0.2763	0.85	0.7707	1.9	0.9928
0.30	0.3286	0.90	0.7970	2.0	0.9953
0.35	0.3794	0.95	0.8209	2.2	0.9981
0.40	0.4284	1.0	0.8427	2.4	0.9993
0.45	0.4755	1.1	0.8802	2.6	0.9998
0.50	0.5205	1.2	0.9103	2.8	0.9999



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN

(Faculty of Engineering)

Sistem Pembuatan

(Manufacturing Systems)

KNP 3053

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 16 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 12.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 11	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Magdalene Andrew Munot		

- Arahan**
(Instruction)
- 1. Jawab SEMUA soalan dari Bahagian A dan B.**
(Answer ALL questions from Section A and B).
 - 2. Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 - 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen)
 - 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 - 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

SECTION A [20 Marks]

ANSWER ALL QUESTIONS

Each correct answer carries one (1) mark.

1. Which of the following statements is more of a general characteristic of a manufacturing organization, as compared to a service organization?
 - a. Short-term demand tends to be highly variable.
 - b. Operations are more capital intensive.
 - c. Outputs are more intangible.
 - d. Quality is more difficult to measure.

2. Which of the following statements concerning manufacturing and service organization is generally true?
 - a. A service facility is more likely to serve national or even international markets.
 - b. Manufacturing organizations generally have more difficulty in matching capacity with demand.
 - c. In many service organizations, such as hospitals and entertainment centers, customers themselves are inputs to the transformation processes.
 - d. Most service organizations can buffer themselves against uncertain demand by creating inventories and smoothing output levels.

3. Which one of the following is NOT a typical objective of production and staffing plans?
 - a. Minimize costs.
 - b. Maximize customer service.
 - c. Minimize equipment utilization.
 - d. Minimize changes in workforce levels.

-
4. A TV repair service company has a seasonal demand for its service, and there is a general shortage of skilled TV repair persons. Which one of the following is a REACTIVE production planning alternative suitable for this situation?
- a. Hire and lay off workers to match the demand requirements.
 - b. Increase the backlog for short term demand surges.
 - c. Offer reduced prices during then slack season.
 - d. Build anticipation inventories.
5. Which one of the following statements concerning aggregate planning alternatives is best?.
- a. Building anticipation inventory during the slack season is an aggressive alternative a firm can follow to satisfy seasonal demand patterns.
 - b. Adjusting workforce levels is an attractive reactive alternative when the cost of training and unemployment compensation is high.
 - c. Creating anticipation inventory has the advantage of increasing customization.
 - d. Using overtime is an undesirable option when the overtime wage premium is high and sustained levels of top worker productivity are important.
6. Which of the following sequences of events, in order of occurrence, best typify the MPS process?.
- a. Authorized production plan; resource availability check; prospective MPS; authorized MPS.
 - b. Resource availability check; prospective MPS; authorized production plan; authorized MPS.
 - c. Prospective MPS; resource availability check; authorized MPS; authorized production plan.
 - d. Authorized production plan; prospective MPS; resource availability check; authorized MPS.

-
7. The available to promise quantity for any period t that has an MPS quantity, other than the first period, is equal to the MPS quantity in period t , minus:
- The projected on hand inventory in period t .
 - The cumulative total of forecasts from period t up to the period that has the next MPS quantity.
 - The cumulative total of booked customer orders from period t up to the period that has the next MPS quantity.
 - The sum of the forecast and booked customer orders for period t .
8. Which one of the following statements about master production scheduling is TRUE?
- There must be a positive MPS quantity in every time period of the MPS record.
 - The booked customer orders for any period will always be greater than the forecast quantity for that period.
 - The master production scheduler must recognized capacity limitations when attempting to create a feasible master production schedule.
 - The master production schedule is determined prior to having an acceptable production plan.
9. Which of the following statements about MRP is TRUE?
- To be classified as a successful MRP user, a company must use either the L4L or POQ rules for lot sizing.
 - MRP gross requirements for a parent item are equal to the planned order releases of its components.
 - MRP logic is based on the logic of uniform, continuous demand, and item independence.
 - MRP gross requirements for a component depend on the planned order releases of its immediate parents.

10. If a planned receipt for an item is due in week 6 and the item's lead time is two weeks, in which week will the corresponding planned order release occur?.
- Week 2
 - Week 4
 - Week 6
 - Week 8
11. Which one of the following reasons creates a pressure for reducing inventories?.
- High interest or opportunity cost.
 - On time delivery requests from customers.
 - Need for better labour or equipment utilization.
 - Need for reduction in total payments to suppliers.
12. What is generally true about the class C items in ABC analysis? They represent:
- About 20 percent of all items.
 - About 50 percent of all items.
 - About 15 percent of the ringgit usage.
 - About 50 percent of the ringgit usage.
13. Which one of the following statements concerning the economic order quantity (EOQ) is TRUE?.
- The EOQ is the order quantity that minimizes annual inventory holding costs.
 - An increase in demand will increase the EOQ value.
 - The time between orders (TBO) will increase with an increase in holding costs.
 - The EOQ formula assumes that there are only three relevant costs: holding, transportation and setup.

14. An inventory system answers two important questions: when to order and how much to order. Which of the following statements correctly explains how a Q system (continuous review system) or a P system (periodic review system) answers these questions?.
- Under a Q system, a fixed quantity is ordered every P time period.
 - Under a Q system, an order is placed to replenish the inventory position up to the target level T when the inventory position reaches the reorder point R .
 - Under a P system, a fixed quantity Q is ordered when the inventory position reaches the reorder point R .
 - Under a P system, an order is placed to replenish the inventory position up to the target level T every P time periods.
15. An operation schedule is a type of scheduling that:
- Determines when employees work.
 - Assigns employees to tasks depending on availability.
 - Assigns customers to a definite time for order fulfillment.
 - Assigns jobs to workstations or employees to jobs for specified time periods.
16. When choosing a priority sequencing rule:
- Select multiple dimension rules because they dominate single dimension rules for all performance measures.
 - Always select the rule that minimize the amount of past due jobs.
 - Test a variety of rules before making a decision.
 - Select CR or S/RO because they use more information.

Table 1			
Job	Process time	Due date	Remaining operations
A	2	9	1
B	3	3	6
C	5	5	2
D	7	7	6
E	1	6	5
F	8	8	7

17. Six jobs are waiting at workstation 023; all the pertinent data are given in the **Table 1**. The shop works eight hours per day. It is now time zero. According to the critical ratio (CR) rule, which one of the following sequences is most appropriate?
- F - A - D - B - E - C
 - D - B - F - E - A - C
 - A - B - D - F - E - C
 - B - C - E - D - A - F

Table 2					
	Projects				
	A	B	C	D	E
Planning stage	20	12	4	9	11
Design stage	5	16	7	6	12

18. A company must take on five new projects. Each project has a planning stage and a design stage, and the planning stage must be completed before the design stage can begin. Also, two project teams are available to work on these projects; Team 1 works only on planning stages of projects, and Team 2 works only on design stages of projects. The times to complete the project stage, in days are shown in **Table 2**. Using the Johnson's procedure, on which day will project D be completed?.
- Day 38 or earlier.
 - Day 39 to day 43.
 - Day 44 to day 47.
 - Day 48 or later.
19. Which of the following is an advantage or characteristic of a flexible flow layout over a line flow layout when volumes are low?.
- General purpose and less capital intensive resources.
 - Faster processing rates.
 - Lower inventory.
 - Less flexibility.
20. A grocery store groups similar products (e.g. fresh fruits and vegetables are all in one area) and routes its customers along fairly predetermined paths. Which one of the following best describes its layout strategy?.
- Flexible flow layout.
 - Hybrid layout.
 - Fixed position layout.
 - Line flow layout.

SECTION B [80 Marks]**Company background**

Flashy Flasher Sdn. Bhd, is a large sized firm employing 500 persons and 75 managerial and administrative personnel. The firm is located at Samarahan Free Trade Industrial Zone and operates for about 50 weeks per year. Flashy Flasher Sdn. Bhd. specializes in producing headlamp and sidelamp for the automotive industry (Shown in **Table 3**). It supplies about 75 auto-parts stores and car dealers in Malaysia and 20 car dealers in Brunei. With the recent boom in the auto industry, Flashy Flasher Sdn Bhd. has enjoyed substantial demand for its product.

The Demand

The forecasted demand and capacity data for producing the lamps (head and side) in 2006 is illustrated in **Table 4**. Undertime is unpaid, and no cost is associated with unused overtime or subcontractor capacity. Producing one unit of lamp on regular time costs Rm100, including Rm50 for labour. Producing a unit of the lamp on overtime would costs Rm150. A subcontractor can produce a unit to Flashy Flasher Sdn Bhd. specifications for Rm180. Holding a lamp in stock cost Rm50 for each quarter period and 100 lamps are currently in stock. The plan calls 450 units to be in stock at the end of quarter 4. The quantities of lamp for subcontract work must not exceed 300 units. No backorder or stockouts are allowed.

Headlamp HL01TV

HL01TV is the firm's most popular product. The headlamp (HL01TV) is made of items A1(4), A2(2) and A3(1). Item A2 is further assembled from items A1(2), B1(1), B2(2) and B3(1) (The number in the bracket shows the usage quantities). See **Table 5** for part number and detail description. Item A1 (screws) are purchased from Skru Sdn. Bhd. located in Miri. The cost to place an order for screws to Skru Sdn. Bhd is Rm25 and the annual holding cost to hold a screw in stock is Rm7.

Forecast breakdown for HL01TV for January and February starting from week 1 to week 8 are 90, 150, 170, 120, 80, 120, 180 and 120. The booked customer orders for this headlamp (HL01TV), starting in week 1 are, 40, 90, 110, 50, 20, 60, 110 and 0. The current on hand inventory is 100 headlamps, the order quantity is 250 units and the lead time is 1 week. The inventory record data for components A1, A2, A3, B1, B2 and B3 is shown in **Table 6**.

Table 3: Product number and description	
Product Numbers	Description
HL01TV	Headlamp for Toyota Vios
HL02HC	Headlamp for Honda City
HL03S	Headlamp for Savy
SL01TV	Sidelamp for Toyota Vios
SL02HC	Sidelamp for Honda City
SL03S	Sidelamp for Savy

Table 4: Demand and Capacity data				
	Quarter			
	1 (Jan – Mar)	2 (Apr.- June)	3 (July – Sept.)	4 (Oct – Dec)
Demand	1000	1100	1900	1000
Capacities				
Regular time	850	850	950	850
Overtime	170	170	190	170
Subcontractor	300	300	300	300

Table 5: Part numbers and description	
Part Numbers	Description
HL	Head lamp
A1	Screw
A2	Head frame subassembly
A3	Head lens
B1	Head lamp module
B2	Back rubber gasket
B3	Head frame

Table 6: Data from inventory record					
Part number	Lead time (weeks)	Safety stock (units)	Lot sizing rule	Quantity on hand	Scheduled Receipt (units and due dates)
A1	1	30	FOQ = 250	150	700 (wk 1 in January).
B1	1	20	FOQ = 180	30	180 (wk 4)
A2	2	0	L4L	100	100 (wk 4 in January)
A3	2	15	FOQ = 400	150	-
B2	3	100	POQ (P = 2 wks)	500	1100 (wk 2 of January)
B3	1	0		70	-

ANSWER ALL QUESTIONS

Question 1 [23 marks]

- a. Use the transportation method of production planning, to prepare **three (3)** [15 marks]
production plans for producing the lamps.
- b. Recommend the “best” production plan and explain your reasons. [4 marks]
- c. What would be the impact of this production plan on the human resources [4 marks]
and finance functions of Flashy Flasher Sdn. Bhd.?

Question 2 [6 marks]

- a. Draw the Bill of Materials (BOM) for product HL01TV. [3 marks]
- b. Calculate the amount of item A1 (screws) needed for producing 5000 units [3 marks]
of item HL01TV (head lamp) in a year.

Question 3 [14 marks]

- a. Develop a master production schedule (MPS) for the HL01TV (head lamp). [12 marks]
- b. If in week 1, a customer requests a new order for 200 units of item HL01TV [2 marks]
(head lamp), when is the earliest due date the entire order could be
shipped?.

Question 4 [29 marks]

Based on the MPS table in **Question 3(a)**:

- a. Develop a material requirements plan (MRP) for eight weeks for item A3. [11 marks]
- b. Develop a material requirements plan (MRP) for eight for item B2. [10 marks]
- c. Explain action notices that will be issued for both MRPs? [3 marks]
- d. Explain the key differences between the FOQ, POQ and L4L lot sizing [5 marks]
rules.

Question 5 [8 marks]

- a. Calculate the total annual cost for item A1 for the current policy. [2 marks]
- b. Calculate the Economic Order Quantity (EOQ) for item A1 (screws). [2 marks]
- c. Calculate the total annual cost for item A1 for the calculated EOQ above. [2 marks]
- d. Comment your answers for (b) and (c). [2 marks]

Appendix 1

Alternatives		Time Period				Unused Capacity	Total Capacity
		1	2	3	4		
Period	Beginning inventory	0	h	$2h$	$3h$	$4h$	
	Regular time	r	$r+h$	$r+2h$	$r+3h$	u	
	Overtime	c	$c+h$	$c+2h$	$c+3h$	0	
	Subcontract	s	$s+h$	$s+2h$	$s+3h$	0	
2	Regular time	$r+b$	r	$r+h$	$r+2h$	u	
	Overtime	$c+b$	c	$c+h$	$c+2h$	0	
	Subcontract	$s+b$	s	$s+h$	$s+2h$	0	
3	Regular time	$r+2b$	$r+b$	r	$r+h$	u	
	Overtime	$c+2b$	$c+b$	c	$c+h$	0	
	Subcontract	$s+2b$	$s+b$	s	$s+h$	0	
4	Regular time	$r+3b$	$r+2b$	$r+b$	r	u	
	Overtime	$c+3b$	$c+2b$	$c+b$	c	0	
	Subcontract	$s+3b$	$s+2b$	$s+b$	s	0	
Requirements							

h = holding cost per unit per period

r = cost per unit to produce on regular time

c = cost per unit to produce on overtime

s = cost per unit to subcontract

u = undertime cost per unit

b = backorder cost per unit per period

**KURSUS
KEJURUTERAAN
ELEKTRONIK DAN
TELEKOMUNIKASI
(KNT)**

**FAKULTI
KEJURUTERAAN**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Komunikasi Fiber Optik
(Optical Fiber Communication)

KNT 4133

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 18 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 12.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 11 & 12	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Sakena Abdul Jabar		

- Arahan**
(Instruction)
- 1. Jawab SEMUA soalan.**
(Answer ALL questions).
 - 2. Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 - 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 - 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 - 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

The Gaussian function for the electric field distribution of the [20 marks]
fundamental mode (LP_{01}) in a single mode fiber is given by;

$$E(r) = E_0 \exp\left(-\frac{r^2}{\omega_0^2}\right)$$

Where $E(r)$ is electric field amplitude distribution, E_0 is maximum amplitude of electric field distribution, r is radius and ω_0 is spot size.

Evaluate and sketch $E(r)/E_0$ against r/a when $0 < r/a \leq 3$ and normalized frequency, $0 < V \leq 3$ for;

- (i) Step index fiber
- (ii) Graded index fiber

Question 2

- a. The threshold optical power for stimulated Brillouin scattering at a [9 marks]
wavelength of $0.85 \mu\text{m}$ in a long single-mode fiber using an injection laser source with a bandwidth of 800 MHz is 127 mW. The fiber has an attenuation of 2 dB km^{-1} at this wavelength. Determine the threshold optical power for stimulated Raman scattering within the fiber at a wavelength of $0.9 \mu\text{m}$ assuming the fiber attenuation is reduced to 1.8 dB km^{-1} at this wavelength.
- b. Briefly explain the reasons for pulse broadening due to *material* [2marks]
dispersion in optical fibers.
- c. The material dispersion parameter for a glass fiber is $20 \text{ ps nm}^{-1} \text{ km}^{-1}$ at a [9 marks]
wavelength of $1.5 \mu\text{m}$. Estimate the *pulse broadening* due to material dispersion within the fiber when light is launched from an injection laser source with a peak wavelength of $1.5 \mu\text{m}$ and an rms spectral width of 2 nm into 30 km length of fiber.

Question 3

- a. A $5 \mu\text{m}$ core diameter single mode step index fiber has a normalized [10 marks]
frequency of 1.7, a core refractive index of 1.48 and a numerical aperture of 0.14. The loss in decibels due to angular misalignment at a fusion splice with a lateral offset of $0.4 \mu\text{m}$ is twice that due to the lateral offset. Estimate the *magnitude in degrees of the angular misalignment*.
- b. Discuss with the suitable diagrams the measurement of dispersion in [10 marks]
optical fibers using *frequency domain* techniques.

Question 4

- a. The output saturation power $P_{\text{out,sat}}$ is defined as the amplifier output power for which the amplifier gain G is reduced by 3 dB (a factor of 2) from its unsaturated value G_0 . Assuming $G_0 \gg 1$, show that in terms of the amplifier saturation power $P_{\text{amp,sat}}$, the output saturation power is [15 marks]

$$P_{\text{out,sat}} = \frac{G_0 \ln 2}{(G_0 - 2)} P_{\text{amp,sat}}$$

- b. Plot the penalty factor $F(G)$, $F_{\text{path}}(G) = \frac{1}{G} \left(\frac{G-1}{\ln G} \right)^2$ as a function of [5 marks]
amplifier gain for gains ranging from 0 to 30 dB.

Question 5

- a. Using the data in the table below, calculate the losses and determine the length of fiber. Assume that the optical system has safety margin of 6 dB. [15 marks]

Transmitter	
Output power	250 μW (-6 dBm)
Output diameter	100 μm
NA	0.30
Connector loss	1 dB
Fiber 1	
Core/cladding diameter	85/125 μm
NA	0.26
Attenuation	2 dB/km
Length	2 km
Connector	
Loss	1.5 dB
Fiber 2	
Core/cladding diameter	100/140 μm
NA	0.3
Attenuation	2 dB/km
Length	L
Receiver	
Sensitivity	125 nA (-39 dBm)
Diameter	150 μm
NA	0.4
Connector Loss	1 dB

- b. Sketch a power budget graph for question (a) [5 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

GELOMBANG MIKRO DAN TEKNOLOGI ANTENNA
(Microwave and Antenna Technology)

KNT 4053

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 17 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 12.00 p.m
Tempat <i>(Place)</i>	: Bilik Seminar 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Thelaha bin Masri		

- Arahan**
(Instruction)
1. **Jawab semua soalan.**
(Answer all questions)
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam kertas jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer sheets provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Answer ALL questions

QUESTION 1

- (a) Draw a block diagram of a microwave communication system. [4 marks]
- (b) There are seven signal control components that we have learned in the lecture. Briefly describe **THREE** of them. [6 marks]
- (c) List down the **FOUR** statements of Maxwell's laws that completely describe electric and magnetic fields? [4 marks]
- (d) "Life is easier at low frequency, but not at high frequency. Although that, there are a few advantages considering high frequencies signals, especially for the microwave signals."
Explain in your own words, technically, the important characteristics of microwave signals in terms of propagation and its usage in the communication systems. [6 marks]

QUESTION 2

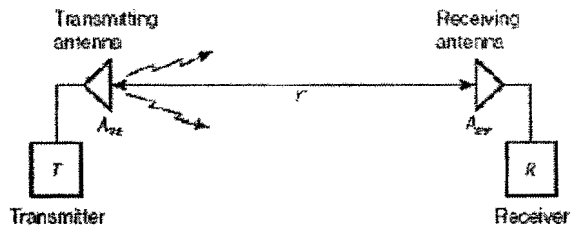
- (a) What are the basic types of microwave transmission lines and what are the factors to be considered in comparing these transmission lines? Draw a suitable table and diagrams to support your answers. [10 marks]
- (b) Given the return loss is 20 dB. Determine the percent reflected power, reflection coefficient, and SWR. [6 marks]
- (c) Referring to *Appendix A*, determine the line width and guide wavelength for a 50Ω microstrip line on 0.025 inch thick alumina ($\epsilon = 9.6$) at 10GHz. [4 marks]

QUESTION 3

- (a) List down **FIVE** important aspects of the Smith Chart. [5 marks]
- (b) With an appropriate diagram, describe how electromagnetic energy from the transmitting source travels to the antenna, and/or from the antenna to the receiver. [5 marks]
- (c) Briefly explain **FIVE** antenna performance parameters. [10 marks]

QUESTION 4

- (a) Sketch the field pattern of directional radiation pattern and label its components. [4 marks]
- (b) State the **TWO** important pattern parameters for an antenna. [4 marks]
- (c) [6 marks]



where

- P_r = received power, W
 P_t = transmitted power, W
 A_{tx} = effective aperture of transmitting antenna, m^2
 A_{rx} = effective aperture of receiving antenna, m^2
 r = distance between antennas, m
 λ = wavelength, m

A Radio link has a 15 Watt transmitter connected to an antenna of $2.5 m^2$ effective aperture at 5 GHz. The receiving antenna has an effective aperture of $0.5 m^2$ and is located at a 15 km line of sight distance from the transmitting antenna. Assuming lossless, matched antenna, find the power delivered to the receiver. (Use Friss transmission formula)

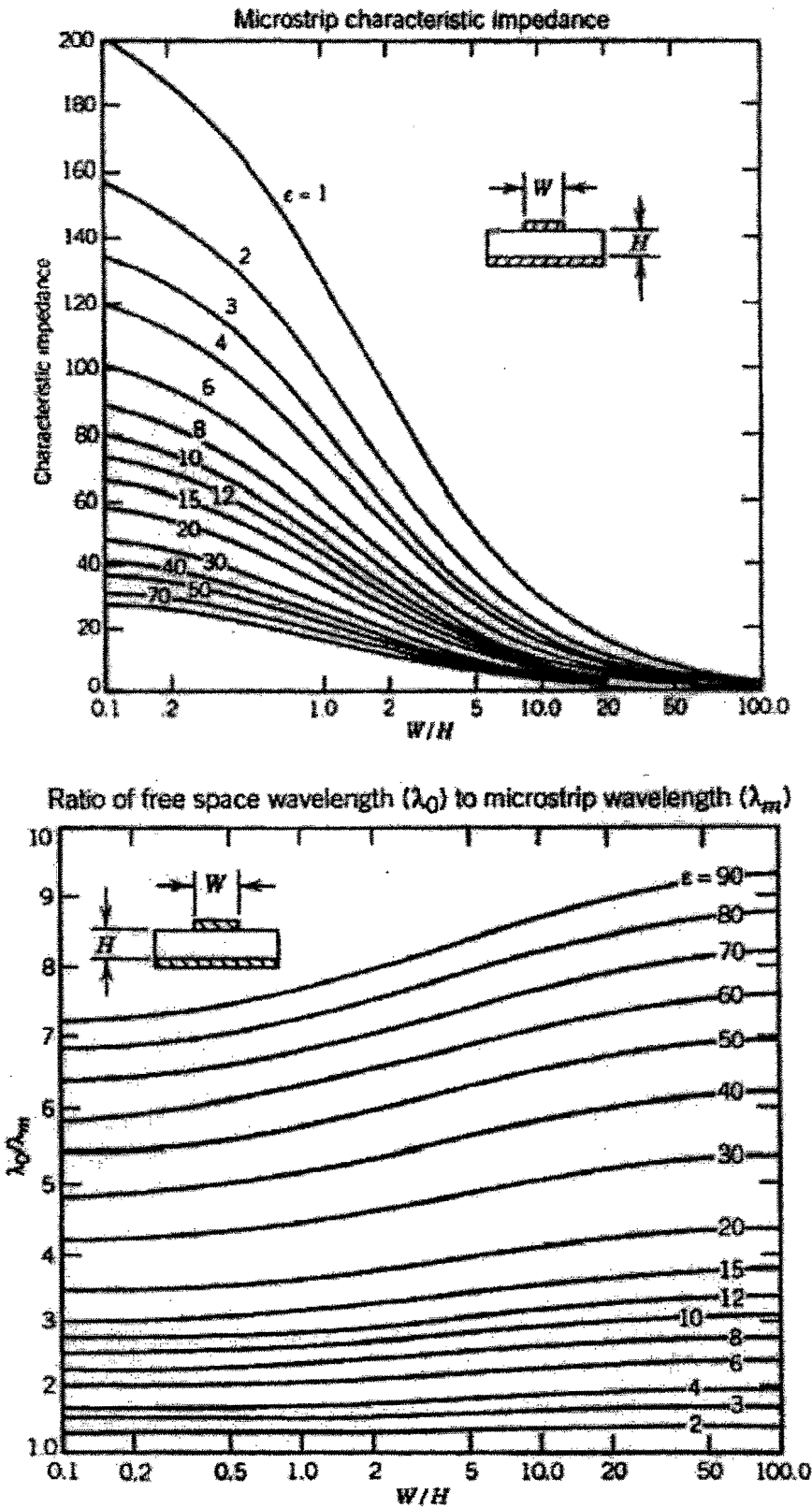
- (d) What is the different between elliptical polarization and circular polarization? [4 marks]
- (e) State the **TWO** conditions characterizing the far field. [2 marks]

QUESTION 5

- (a) List down **FIVE** factors that End-fire antennas widely used in space applications. [5 marks]
- (b) Discussion the radiation pattern and the antenna shape for conical spiral antenna and log-periodic antenna. [6 marks]

-
- (c) Describe briefly what is a 'Smart Antenna'? [4 marks]
- (d) What is 'MIMO' and elaborate briefly the type of antenna that is suitable to be used with a 'MIMO' system. [5marks]

APPENDIX A





UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Rangkaian dan Perkhidmatan TELEKOMUNIKASI
(Telecommunication Networks and Services)

KNT 4073

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 8 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: Makmal Elektronik	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: En. Thelaha Masri		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan dalam Bahagian A dan jawab mana-mana DUA (2) soalan dalam Bahagian B.**
(Answer ALL questions in Section A and answer any TWO (2) questions in Section B).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

SECTION A: Answer all questions in section A

Question 1

In its simplest form, a telecommunication network can be defined as a set of equipment and facilities that provides a service: transfer of information between users located at various geographical points. In other words, a telecommunication network:

- i. distribute information
- ii. provide access for gathering information
- iii. essential infrastructure in every society
- iv. transmit information at high speed
- v. flexible in their use

Based on the above definition, give one example of a service that is familiar to you that suite this discussion. For example, the Broadcasting Department (Radio or TV), Telephone services, the Police or Traffic communication networks & services, the ship to shore Communication or Computer networks & services etc.

Draw a diagram / block diagram that shows the main functions of every section involved in the department and you should also sketch the basic network & facilities / links, if any. (Include the equipment, studios, communication equip, controlling room, etc.)

[20 marks]

Question 2

For a special case, the 'Erlang's lost-call formula' is written as

$$B = E_{1,N}(A) = \frac{A^N / N!}{\sum_{k=0}^N A^k / k!},$$

which denotes the loss probability for a full availability group N trunks offered traffic A erlangs, whereby the first Erlang distribution formula is computed as

$$P(x) = \frac{A^x / x!}{\sum_{k=0}^N A^k / k!}.$$

If a group of five trunks is offered 2E of traffic, using the formula given above, find,

- | | | |
|------|--|-----------|
| i. | The grade of service. | [6 marks] |
| ii. | The probability that only one trunk is free. | [4 marks] |
| iii. | The probability that only one trunk is busy. | [4 marks] |
| iv. | The probability that at least one trunk is free. | [6 marks] |

Question 3

- (a) On average, one call arrives every 5 seconds. During a period of 30 seconds, what is the probability that:
- i No call arrives? [3 marks]
 - ii One call arrives? [3 marks]
 - iii Two calls arrive? [3 marks]
 - iv More than **five** calls arrive? [8 marks]
- (b) Define the term “traffic intensity”. [3 marks]

SECTION B: Answer ANY TWO (2) questions only.

Question 1

- (a) Explain what is central office (CO), and explain what is the function of a central office in the telecommunication system. [7 marks]
- (b) List down several signalling and control use in PSTN. [6 marks]
- (c) Explain what is In-Band Signalling and Control and how it is different from Out-of Band Signalling and control? [7 marks]

Question 2

- (a) What are the most attractive characteristic and benefit of ISDN compare to PSTN? [5 marks]
- (b) ISDN is currently available in two interface varieties; the BRI and PRI. Explain briefly what are BRI and PRI in terms of channel and channel rate. [6 marks]
- (c) What are Terminal Equipment (TE) and Terminal Adapters (TA) in ISDN? [5 marks]
- (d) You can call other ISDN users, which could be remote sites in your own IS organization, public BBSs, customer sites for EDI or transaction processing, or commercial online services such as CompuServe. The data applications of ISDN require that both parties in the connection have ISDN or packet data service.
Now, what if you need to connect with somebody that isn't ISDN capable? Explain your answer briefly on how to handle this problem, using a suitable diagram. [4 marks]

Question 3

- (a) ATM data can be of 3 types. Name and explain each of the 3 types. (You can give examples to the application of each type to support your view). [6 marks]
- (b) ATM is based on a 53-octet cell structure comprising 48 octets of payload and 5 octets of overhead. Draw the ATM cell structure showing also the content of the 5-octet header. [6 marks]
- (c) Discuss the advantages and disadvantages of ATM. [8 marks]

Question 4

- (a) List down several advantages and disadvantages of wireless technologies and explain briefly why? [5 marks]
- (b) For cellular networks, cells are generally divided into 3 categories.
i. Name the 3 categories and explain briefly each category. [5 marks]
ii. Explain the concept of frequency reuse and relate it to cells. [5 marks]
- (c) What is Wireless Local Loop (WLL) and explain how WLL can save cost when implemented [5 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN

(Faculty of Engineering)

Optoelektronik

(Optoelectronics)

KNT3113

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 7 November, 2005 (Isnin)
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 a.m – 12.00 noon
Tempat <i>(Place)</i>	: Bilik Seminar 11	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Dr. Awangku Abdul Rahman B. Pgn Hj Yusof		

Arahan <i>(Instruction)</i>	: <ol style="list-style-type: none">Jawab semua soalan. <i>(Answer all the questions)</i>Baca soalan dengan teliti sebelum menjawab. <i>(Read the questions carefully before answering)</i>Tulis jawapan hanya di dalam kertas jawapan yang disediakan menggunakan pen sahaja. <i>(Write the answers in the answer sheets provided using pen only)</i>Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan. <i>(No talking and do not disturb other candidates during the duration of test)</i>Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir. <i>(Candidates are not allowed to leave in the first 30 minutes and the last 15 minutes)</i>
---------------------------------------	---

Question 1

- a. Briefly describe the two processes by which light can be emitted from an atom.
- b. Describe what is meant by population inversion and illustrate your answer with an energy level diagram of a common non-semiconductor laser.

[5 marks]

[5 marks]

Question 2

A ruby laser contains a crystal length of 4.5cm with a refractive index of 1.80. The peak emission wavelength is $0.60 \mu\text{m}$. Determine the number of

- i. longitudinal modes, and
- ii. frequency separation

[3.75 marks]

[3.75marks]

Question 3

- a. Describe briefly the structure, carrier and optical confinement of a double heterojunction (DH) injection laser, with the aid of suitable diagrams.
- b. A DH injection laser has an optical cavity of length $45 \mu\text{m}$ and width $20 \mu\text{m}$. At normal operating temperature the loss coefficient is 12cm^{-1} and the current threshold is 35mA. When the mirror reflectivity at each end of the optical cavity is 0.4, calculate the gain factor β for the device.

[7.5 marks]

[5 marks]

Question 4

Describe briefly the following types of noise generally found in optical detectors.

- i. Johnson noise
- ii. Shot noise
- iii. Photon noise

[2.5 marks]

[2.5 marks]

[2.5 marks]

Question 5

- a. Photon detectors are generally categorized into two different types; photon and thermal detectors. Photon detectors may be further subdivided into **three** different groups. Describe briefly each of these groups.

[7.5 marks]

- b. A photodiode has a quantum efficiency of 65% when photons of energy $1.8 \times 10^{-19} \text{ J}$ are incident upon it.

- i. At what wavelength is the photodiode operating?

[2.25 marks]

- ii. Calculate the incident optical power required to obtain a photocurrent of $2.5 \mu\text{A}$ when the photodiode is operating as above.

[2.75 marks]

**KURSUS
KEJURUTERAAN
ELEKTRONIK DAN
KOMPUTER
(KNK)**

**FAKULTI
KEJURUTERAAN**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

PENGANTARAMUKA MIKROKOMPUTER
(Microcomputer Interfacing)

KNK4063

Peperiksaan (Examination)	: Akhir	Tarikh (Date)	: 8 November 2005
Semester	: Sesi 2005/2006	Masa (Time)	: 9.00 am – 12.00 pm
Tempat (Place)	: Bilik Seminar 11	Jangkamasa (Duration)	: 3 jam
Pensyarah (Lecturer)	: Martin Anyi		

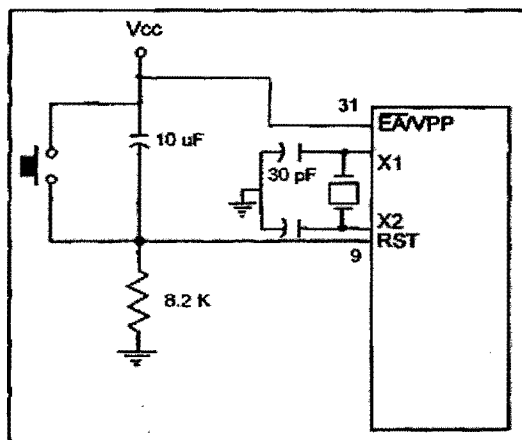
Arahan (Instruction)	: <ol style="list-style-type: none">Jawab lima (5) soalan sahaja. (Answer FIVE questions only)Baca soalan dengan teliti sebelum menjawab. (Read the questions carefully before answering)Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja. (Write the answers only in the answer books provided using only pen)Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan. (No talking or disturbing other candidates during the duration of test)Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir. (Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)
--------------------------------	---

Question 1

- (a) Explain the differences between a microcontroller and a microprocessor. To further illustrate your explanation, draw a block diagram for each of the system. [6 marks]
- (b) Briefly explain areas of applications for microcontrollers and microprocessors. [4 marks]

Question 2

- (a) Explain the effects of resetting the 8051 microcontroller. [6 marks]
- (b) **Figure 1** shows the reset circuitry of the 8051 microcontroller. Explain what is/are the functions of the 10 μF capacitor and the 8.2 $\text{K}\Omega$ resistor used. [4 marks]

**Figure 1****Question 3**

- (a) An eight bit data is about to be received at Port 0 of the 8051 system. Write a simple program so that the microcontroller can receive the data. [6 marks]
- (b) Draw a suitable wiring / connection diagram that can be used in Question 3(a). [4 marks]

Question 4

- (a) Write a program to output a 5 ms square wave at P2.3 of an 8051 microcontroller system. Assume that the system uses 11.0592 MHz crystal and timer 1. Please include comments at every line of your program. [8 marks]

Note: The timer mode table for 8051 microcontroller is given in **Figure 2**.

[2 marks]

- (b) Draw a diagram of the microcontroller system used in question 4 (a).

(MSB)
(LSB)

GATE	C/T	M1	M0	GATE	C/T	M1	M0
Timer 1				Timer 0			

GATE Gating control when set. Timer/counter is enabled only while the INTx pin is high and the TRx control pin is set. When cleared, the timer is enabled whenever the TRx control bit is set.

C/T Timer or counter selected cleared for timer operation (input from internal system clock). Set for counter operation (input from Tx input pin).

M1 Mode bit 1

M0 Mode bit 0

M1	M0	Mode	Operating Mode
0	0	0	13-bit timer mode
0	1	1	8-bit timer/counter THx with TLx as 5-bit prescaler
0	1	1	16-bit timer mode
1	0	2	16-bit timer/counters THx and TLx are cascaded; there is no prescaler
1	0	2	8-bit auto reload
1	0	2	8-bit auto reload timer/counter; THx holds a value which is to be reloaded into TLx each time it overflows.
1	1	3	Split timer mode

Figure 2

Question 5

- (a) Clock pulses are fed into pin T1 of an 8051 microcontroller system. Write a program for counter 1 in mode 2 to count the pulses and display the state of the TL1 count on P2. [8 marks]

- (b) Draw a diagram of the microcontroller system used in Question 5 (a). [2 marks]

Question 6

- (a) **Figure 3** shows the timing diagram for ADC0804 (analog to digital converter) operation. Based on the diagram given, explain all necessary steps taken in order for the 8051 to read the data pins of the ADC0804. [6 marks]

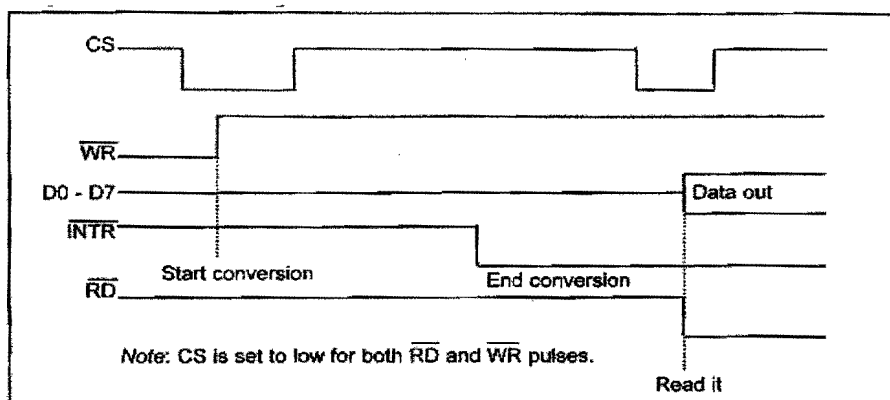


Figure 3

- (b) Draw and explain a suitable block diagram of the system used in Question 6(a) [4 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

ARKITEKTUR MULTIPROCESSOR
(Multiprocessor Architecture)

KNK 3043/4133

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 17 November 2005
Semester	: Semester 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 11	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Martin Anyi		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions)
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Question 1

Explain briefly the progress of hardware technology used in each generation of electronic computer listed below;

- i. 1st Generation [2 marks]
- ii. 2nd Generation [2 marks]
- iii. 3rd Generation [2 marks]
- iv. 4th Generation and [2 marks]
- v. 5th Generation [2 marks]

Question 2

- i. List four computer architecture classifications suggested by Flynn. [4 marks]
- ii. Explain the class of computer architecture that is reserved for parallel computer. Your answer should be supported by a diagram. [6 marks]

Question 3

- i. COMA and NUMA are shared-memory multiprocessor models. Draw the block diagram for each of the model, explain and compare them briefly. [5 marks]
- ii. Draw block diagrams for a typical CISC and RISC processor architectures. Explain and compare them briefly. [5 marks]

Question 4

- i. Parallel programming models are specifically designed for multiprocessors, multicomputers, or vector/SIMD computers. Name a model and state which system it is intended for. [2 marks]
- ii. Further explain the parallel programming model that you have named above. [8 marks]

Question 5

Imagine that you are appointed by the authority to set up a Tsunami early detection system for our country using parallel computer technology.

Explain:

- i. Your method of detection (sensor, type of input, location, transmission etc.) and **[5 marks]**
- ii. Your choice of parallel computer system, why do you choose that particular system and where do you park it/them. **[5 marks]**

Note: Your answer for Question 5 requires you to sketch a diagram that shows all components of the system, interconnections and location.

KURSUS GABUNGAN (KNL)

**FAKULTI
KEJURUTERAAN**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Prinsip Kejuruteraan Telekomunikasi
(Telecommunication Engineering Principle)

KNL 2283

Peperiksaan (Examination)	: Akhir	Tarikh (Date)	: 7 November 2005
Semester	: 1 Sesi 2005/2006	Masa (Time)	: 2.00 p.m - 5.00 p.m
Tempat (Place)	: BS 11	Jangkamasa (Duration)	: 3 jam
Pensyarah (Lecturer)	Pn. Siti Kudnie Sahari		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1 (20 marks)

1. For the train of square waves shown in **Figure 1**

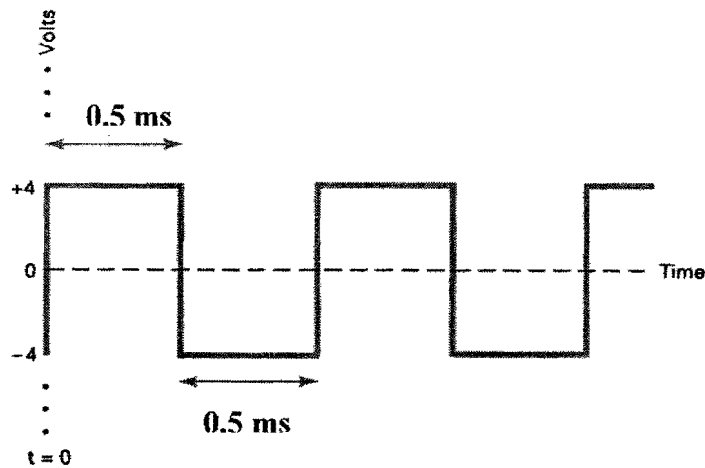


Figure 1

- Determine the peak amplitudes and frequencies of the first odd harmonics. [5 marks]
- Draw the frequency spectrum. [5 marks]
- Calculate the total instantaneous voltage for the several times at $t = 0\mu s, 62.5\mu s, 125\mu s, 250\mu s, \dots, 1000\mu s$ and sketch the time domain waveform. [10 marks]

Question 2 (20 marks)

- Define amplitude modulation. [2 marks]
- What are the two technical drawbacks to the conventional AM? [2 marks]
- What is SSB? What are the technical advantages in term of power use and bandwidth use? [3 marks]
- Draw the block diagram of transmitter using low level-modulation and transmitter with high level modulation. Explain each block diagram. [6 marks]
- Draw the block diagram of superheterodyne receiver. What does each do? [7 marks]

Question 3 (20 marks)

3. a. For an FM modulator with a modulation index $m=1$, a modulating signal $v_m(t) = V_m \sin(2\pi 1000t)$ an unmodulated carrier $v_c(t) = 10 \sin(2\pi 500kt)$, determine
- (i) Number of sets of significant side frequencies. [2 marks]
 - (ii) Their amplitudes. [4 marks]
 - (iii) Draw the frequency spectrum showing their relative amplitudes. [5 marks]
- b. For an FM modulator with a peak frequency deviation $\Delta f=10\text{kHz}$, a modulating-signal frequency $f_m=10\text{kHz}$, $V_c=10\text{V}$ and 500kHz carrier, determine
- (i) Actual minimum bandwidth from Bessel function table. [2 marks]
 - (ii) What is Carson's rule? Find the approximate minimum bandwidth using Carson's rule. [2 marks]
 - (iii) Plot the output frequency spectrum for the Bessel approximation. [5 marks]

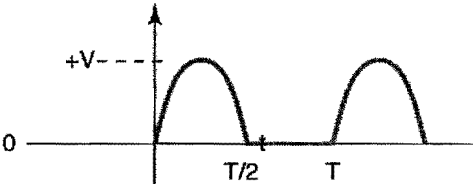
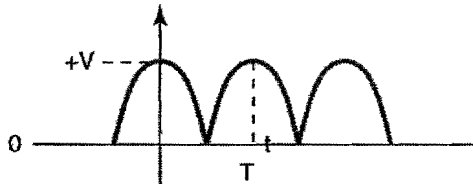
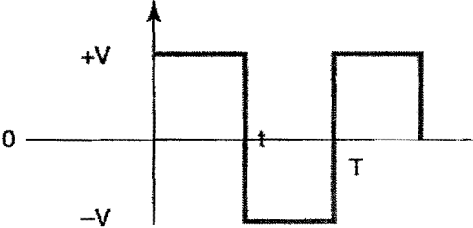
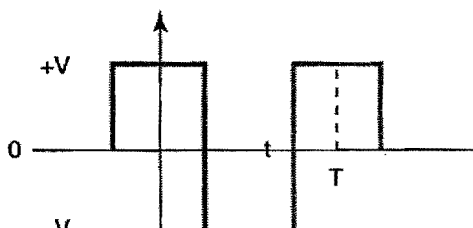
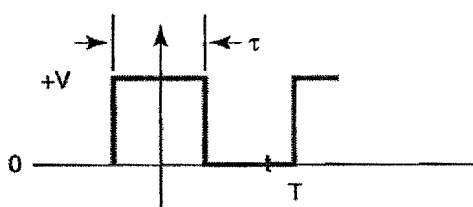
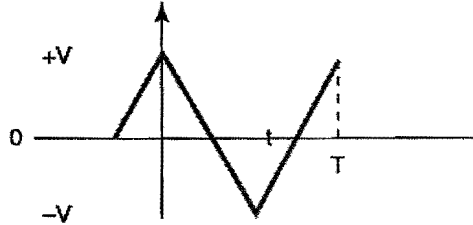
Question 4 (20 marks)

4. a. Draw the block diagram of pulse code modulation system and briefly explain the function of each block. [5 marks]
- b. What is synchronization? Why is sync necessary function? [3 marks]
- c. What is delta modulation? What is the overall concept? Why delta modulation used in some application? [3 marks]
- d. Compare frame and bit sync. Why is frame sync needed? [2 marks]
- e. What is the Nyquist sampling theorem? [2 marks]
- f. Find the Nyquist sampling rate if a signal has bandwidth of 3000Hz . If the signal is digitized to 8-bit resolution, how many bits are generated per second? [2 marks]
- g. What is the alternative modulation technique that can be used to replace the pulse code modulation? Give two advantages of this system. [3 marks]

Question 5 (20 marks)

5. a. Define and compare modulation, coding, format and protocol. [8 marks]
- b. Give five differences between a *synchronous* system and *asynchronous* system? [5 marks]
- c. Compare the parity and checksum schemes used to detect errors. [4 marks]
- d. What is the advantage and the disadvantage of error detection and correction? [3 marks]

Modulation Index	Carrier		Side Frequency Pairs													
	m	J_0	J_1	J_2	J_3	J_4	J_5	J_6	J_7	J_8	J_9	J_{10}	J_{11}	J_{12}	J_{13}	J_{14}
0.00		1.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0.25		0.98	0.12	—	—	—	—	—	—	—	—	—	—	—	—	—
0.5		0.94	0.24	0.03	—	—	—	—	—	—	—	—	—	—	—	—
1.0		0.77	0.44	0.11	0.02	—	—	—	—	—	—	—	—	—	—	—
1.5		0.51	0.56	0.23	0.06	0.01	—	—	—	—	—	—	—	—	—	—
2.0		0.22	0.58	0.35	0.13	0.03	—	—	—	—	—	—	—	—	—	—
2.4		0	0.52	0.43	0.20	0.06	0.02	—	—	—	—	—	—	—	—	—
2.5		-0.05	0.50	0.45	0.22	0.07	0.02	0.01	—	—	—	—	—	—	—	—
3.0		-0.26	0.34	0.49	0.31	0.13	0.04	0.01	—	—	—	—	—	—	—	—
4.0		-0.40	-0.07	0.36	0.43	0.28	0.13	0.05	0.02	—	—	—	—	—	—	—
5.0		-0.18	-0.33	0.05	0.36	0.39	0.26	0.13	0.05	0.02	—	—	—	—	—	—
5.45		0	-0.34	-0.12	0.26	0.40	0.32	0.19	0.09	0.03	0.01	—	—	—	—	—
6.0		0.15	-0.28	-0.24	0.11	0.36	0.36	0.25	0.13	0.06	0.02	—	—	—	—	—
7.0		0.30	0.00	-0.30	-0.17	0.16	0.35	0.34	0.23	0.13	0.06	0.02	—	—	—	—
8.0		0.17	0.23	-0.11	-0.29	-0.10	0.19	0.34	0.32	0.22	0.13	0.06	0.03	—	—	—
8.65		0	0.27	0.06	-0.24	-0.23	0.03	0.26	0.34	0.28	0.18	0.10	0.05	0.02	—	—
9.0		-0.09	0.25	0.14	-0.18	-0.27	-0.06	0.20	0.33	0.31	0.21	0.12	0.06	0.03	0.01	—
10.0		-0.25	0.05	0.25	0.06	-0.22	-0.23	-0.01	0.22	0.32	0.29	0.21	0.12	0.06	0.03	0.01

Waveform	Fourier Series
<p>odd</p> 	$v(t) = \frac{V}{\pi} + \frac{V}{2} \sin \omega t - \frac{2V}{3\pi} \cos 2\omega t - \frac{2V}{15\pi} \cos 4\omega t + \dots$ $v(t) = \frac{V}{\pi} + \frac{V}{2} \sin \omega t + \sum_{N=2}^{\infty} \frac{V[1 + (-1)^N]}{\pi(1 - N^2)} \cos N\omega t$
<p>even</p> 	$v(t) = \frac{2V}{\pi} + \frac{4V}{3\pi} \cos \omega t - \frac{4V}{15\pi} \cos 2\omega t + \dots$ $v(t) = \frac{2V}{\pi} + \sum_{N=1}^{\infty} \frac{4V(-1)^N}{\pi[1 - (2N)^2]} \cos N\omega t$
<p>odd</p> 	$v(t) = \frac{4V}{\pi} \sin \omega t + \frac{4V}{3\pi} \sin 3\omega t + \dots$ $v(t) = \sum_{N=\text{odd}}^{\infty} \frac{4V}{N\pi} \sin N\omega t$
<p>even</p> 	$v(t) = \frac{4V}{\pi} \cos \omega t - \frac{4V}{3\pi} \cos 3\omega t + \frac{4V}{5\pi} \cos 5\omega t + \dots$ $v(t) = \sum_{N=\text{odd}}^{\infty} \frac{V \sin N\pi/2}{N\pi/2} \cos N\omega t$
<p>even</p> 	$v(t) = \frac{V\tau}{T} + \sum_{N=1}^{\infty} \left(\frac{2V\tau}{T} \frac{\sin N\omega t/T}{N\pi\tau/T} \right) \cos N\pi\tau$
<p>even</p> 	$v(t) = \frac{8V}{\pi^2} \cos \omega t + \frac{8V}{(3\pi)^2} \cos 3\omega t + \frac{8V}{(5\pi)^2} \cos 5\omega t + \dots$ $v(t) = \sum_{N=\text{odd}}^{\infty} \frac{8V}{(N\pi)^2} \cos N\omega t$



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Pemrograman Berstruktur
(Structured Programming)

KNL 1353

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 8 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am -12.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Cik Rohana Sapawi		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Part I [20 marks]

Answer true or false. Each question carries 1 mark.

1. The name of primary function of a C++ program must be **Main**.
2. By default, any C++ statement is location sensitive.
3. The statement `cout << setw(5) | setfill ('&') << X;` displays `&&123`.
4. The statement `cout << c1 ;` causes the character assigned to `c1` to be printed to the screen.
5. We need the **ofstream** header to write output to an external file.
6. You must create link between an external disk file and an **ifstream** object before you can read your input data.
7. A **switch** statement can be replaced by **if-else-if** control structure.
8. Given `x=200` and `y= -400`, determine whether each of these logical expression is true or false.
`(x < y && x != y)`
9. In a for loop expression, the starting counter value must be smaller than the ending counter value.
10. In C++, `day * = 5` may used as a third expression in **for** loop.
11. It is permissible to use constant in the argument list to call an overloaded function.
12. If there is ambiguity in a function call, the program will not compile.
13. Constructor functions cannot return values.
14. A function name is the only identifier that can be followed by parentheses.
15. We can use global variables to size arrays that are members of classes.
16. We cannot modify **const** type data in programs.
17. A partial filled multidimensional array has all its filled memory positions together at the beginning of the reserved block of memory.
18. To efficiently work with a multidimensional array, it is necessary to pass the filled size of the array as separate arguments in a function call.

19. Brackets can immediately follow a pointer variable name in an executable statement.
20. No space is allowed between the * operator and the data type in a declaration.

Part II

Answer ALL questions.

Question 1 [10 marks]

Debug the program until it produced the following output.

This program has a large number of errors.

Use the method we

described to fix it.

As the program more and more, you will
get better at debugging.

```
/******  
** Put a banner on your programs  
*****  
#include (iostream)  
using namespace std  
void <main>void  
[  
    cout<<" This program has a \n large number of errors.\n' ;  
    cout<<"\nUse the method we \  
    described to fix it.";  
    cot (As you program more and more, you will \  
    get better at debugging.)  
]
```

[10 marks]

Question 2 [12 marks]

In this section, examine the C++ statement carefully and write whether they are valid or invalid.

If valid, write the word "VALID" and explain the expected output.

However if invalid, write the word "INVALID" and state why it is invalid and correct it.

i) Assume *a* is *int* and *a*=1,

a. while (*a*<5) { cout <<"a=" << *a* ; *a*-- ; }

[3 marks]

b. Do (cout << "a=" << *a*; *a*++) while (*a*<5):

[3 marks]

ii) for (*day*=1, *day*<3, *day* ++)

[3 marks]

iii) float a23b[99]; 1xy[66];

[3 marks]

Question 3 [6 marks]

Consider the following expression

int a = ++ x

int b = x ++

How would the first expression differ compared with the second expression? What is the value of a, b and x if initially x is 5?

[6 marks]

Question 4 [32 marks]

Write the expected output for the following C++ statement below.

```
a) #include <iostream>
using namespace std;
int main ( )
{
    int a=4, b=-2, c=0, x;

    if ( a ) cout<<"a="<<a<<" , !a="<<!a<<endl;
    if ( b ) cout<<"b="<<b<<" , !b="<<!b<<endl;

    if ( c ) cout<<"Never gets printed"<<endl;
    else    cout<<"c="<<c<<" , !c="<<!c<<endl;

    if ( a>b || b>c && a==b ) cout<<"Answer is TRUE\n";
    else                    cout<<"Answer is FALSE\n";

    x= a>b || b>c && a==b;
    cout<<"x="<<x<<" , !x="<<!x<<endl;
}
```

[10 marks]

```
b) #include <iostream>
using namespace std;

int days_in_month = 31;
void april();

int main()
{
    int friends_birthdays=0;

    cout<<"Before call to april() "<<endl;
    cout<<"days_in_month = "<<days_in_month<<endl
    <<"friends_birthdays = "<<friends_birthdays<<endl<<endl;
```

```
    april( );

    cout<<"After call to april( )" <<endl;
    cout<<"days_in_month = "<<days_in_month<<endl
        <<"friends_birthdays = "<<friends_birthdays<<endl<<endl;
}
void april( )
{
    int friends_birthdays=2;
    days_in_month=30;
}
```

[10 marks]

c) `#include <iostream>`
`using namespace std;`
`int main ()`
`{`
 `int i, j, k, m;`

 `for (i=1; i<=5; i+=2)`
 `{`
 `for (j=1; j<=4; j++)`
 `{`
 `k = i+j;`
 `cout<<"i= "<<i<<" , j= "<<j<<" , k= "<<k<<endl;`
 `}`
 `m=k+i;`
 `}`
`}`

[12 marks]**Question 5 [20 marks]**

The grading structure for a class is the following:

90-100	A
80-89	B
70-79	C
60-69	D
<60	F

Write a program that prints the grades for 10 different numerical scores. As input, the program is to read the 10 scores (all integer) from the data file GRADE.DAT. The content are line 1 score1 score2 score3..... score10.

Print the result to file GRADE.OUT in the following table:

<u>Numerical score</u>	<u>Grade</u>
.....
.....
.....

[20 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Mikroelektronik
(Microelectronic)

KNL 3183

Peperiksaan (Examination)	: Akhir	Tarikh (Date)	: 15 November 2005
Semester	: 1 Sesi 2005/2006	Masa (Time)	: 9.00 am -12.00 pm
Tempat (Place)	: Bilik Seminar 11 & 12	Jangkamasa (Duration)	: 3 jam
Pensyarah (Lecturer)	: En. Norhuzaimin Julai		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan Bahagian A dan SATU soalan Bahagian B.**
(Answer ALL questions in Section A and ONE question in Section B).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

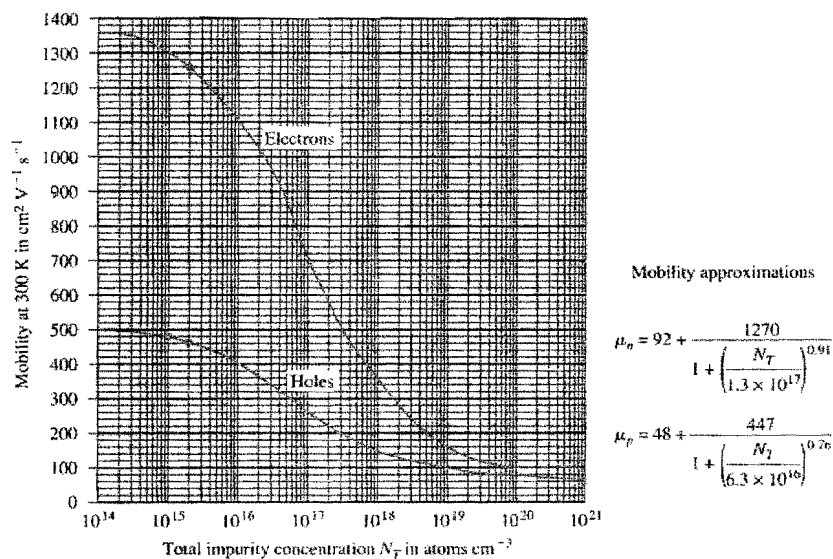
Use the following constants where appropriate

V_T	25 mV at room temperature
ϵ_{ox}	3.45×10^{-11} F/m
ϵ_o	8.85×10^{-12} F/m
ϵ_s	1.04×10^{-10} F/m
q	1.6×10^{-19} C
n_i	10^{10} atoms/cm ³ (At room temperature)
K_n	$25 \mu\text{A/V}^2$
V_{TN}	1 V

Use the following table where appropriate

Insulators	$\rho > 10^5 \Omega\text{-cm}$
Semiconductors	$10^{-3} < \rho < 10^5 \Omega\text{-cm}$
Conductors	$\rho < 10^{-3} \Omega\text{-cm}$

Use the following figure where appropriate



Use the following relations where appropriate

$$\tau_{PHL} = R_{onN} C \left\{ \ln \left[4 \left(\frac{V_H - V_{TN}}{V_H + V_L} \right) - 1 \right] + \frac{2V_{TN}}{V_H - V_{TN}} \right\}$$

$$R_{onN} = \frac{1}{K_n (V_H - V_{TN})}$$

$$\tau_p = \frac{\tau_{PHL} + \tau_{PLH}}{2} = \tau_{PHL}$$

If it is assumed the inverter is "symmetrical", $(W/L)_p = 2.5(W/L)_n$, then $\tau_{PLH} = \tau_{PHL}$

Section A: Answer All Questions

QUESTION 1

- (a) Explain, with the aid of appropriate diagram(s), how by adding the impurities will improve the conductivity in the semiconductor. Your discussion should include types of impurities, electron and holes concentration [8 mark]
- (b) Silicon is doped with a donor concentration of 5×10^{16} atoms/cm³
- (i) Find the hole and electron concentrations [3 mark]
 - (ii) Find the hole and electron mobilities [3 mark]
 - (iii) Find the resistivity of this Silicon material at 300 K [3 mark]
 - (iv) Is this n- or p-type silicon? [3 mark]

QUESTION 2

- (a) Consider a pn junction diode having $N_A = 10^{17}/\text{cm}^3$ on the p-type side and $N_D = 10^{16}/\text{cm}^3$ on the n-type side
- (i) Draw the graph of carrier concentration, charge density $\rho(x)$, electric field $E(x)$, and electrostatic potential $V(x)$ all with respect to x_p and x_n . [12 mark]
- (b) A diode is operating at a current of 100 μA
- (i) What is the diffusion capacitance if the diode transit time is 100 ps? [4 mark]
 - (ii) How much charge is stored in the diode? [4 mark]

QUESTION 3

- (a) With the aid of appropriate diagram(s), explain the following three different bias conditions
- (i) Accumulation Region [2 mark]
 - (ii) Depletion Region [3 mark]
 - (iii) Inversion Region [3 mark]

- (b) For the circuits in figure 1, $\mu_n C_{ox} = 2.5 \mu_p C_{ox}$, $|V_t| = 1 \text{ V}$, $\lambda = 0$, $\gamma = 0$, $L = 10 \mu\text{m}$ and $W = 30 \mu\text{m}$, unless otherwise specified.

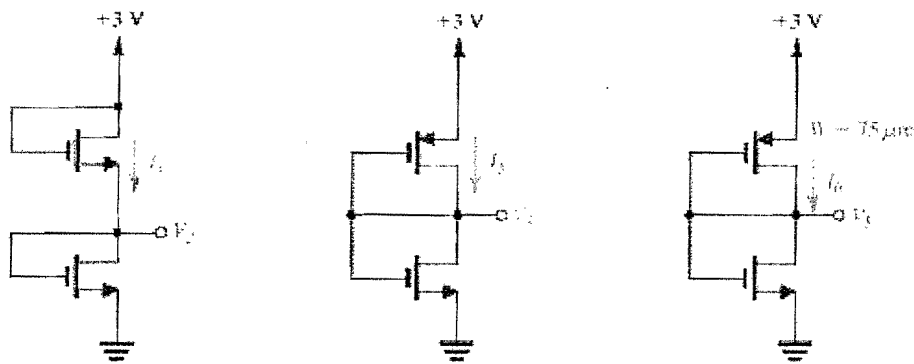


Figure 1

- (i) I_1 and V_2 [4 mark]
(ii) I_3 and V_4 [4 mark]
(iii) I_6 and V_5 [4 mark]

QUESTION 4

Figure 2 shows a MOSFET common-source amplifier with feedback bias in which gate-to source bias is derived from a voltage divider connected to the drain. Capacitors C_1 and C_3 couple the ac signal into and out of the amplifier, respectively

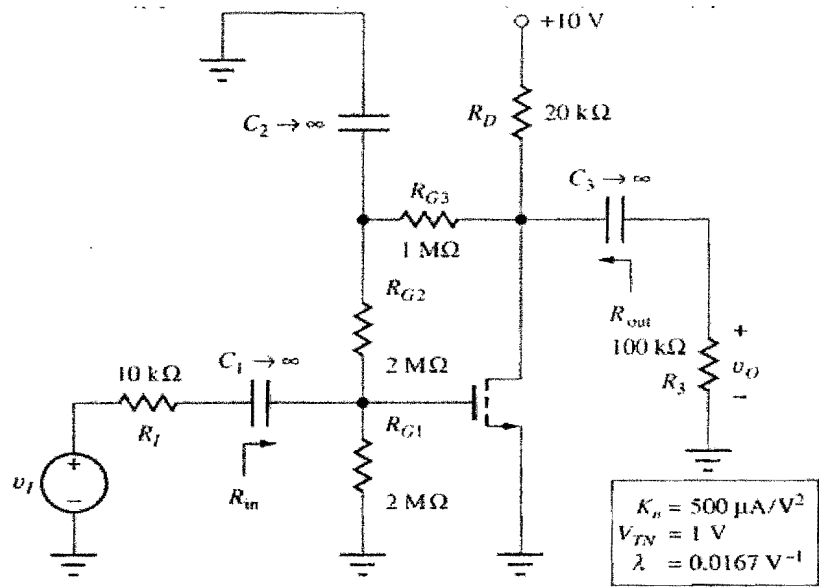


Figure 2

- (a) What is the function of bypass capacitor, C_2 ? [5 mark]
- (b) Draw a complete small signal equivalent circuit for the amplifier assuming all capacitors behave as short circuits at signal frequencies [5 mark]
- (c) Find the input and output resistance for the common-source amplifier [5 mark]
- (d) Hence, find the voltage gain [5 mark]

Section B: Answer ONLY ONE Question

QUESTION 5

- (a) With the aid of the appropriate diagram(s), explain the dynamic behavior of the CMOS inverter. You should the discussion of the high to low output transition and low to high output transition [10 mark]
- (b) A high performance CMOS microprocessor design requires 5 million logic gates and will be placed in a package that can dissipate 20 W.
 - (i) What is the average power that can dissipated by each logic gate on the chip [5 mark]
 - (ii) If a supply voltage of 3.3 V is used what is the average current that must be supplied to the chip [5 mark]

QUESTION 6

- (a) Explain the effect to the drain current, gate capacitance, total power, and power-delay product if the physical dimension of IC is reduced by a factor of α [10 mark]
- (b) What are the sizes of the transistor in the CMOS inverter if it must drive a 1 pf capacitance with an average propagation delay of 3 ns? Design the inverter for equal rise and fall times. Use $V_{DD} = 5$ V, $V_{TN} = 1$ V, and $V_{TP} = -1$ V [10 mark]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Electronic Circuits
(Litar Elektronik)

KNL 2383

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 14 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 pg – 12.00 tgh
Tempat <i>(Place)</i>	: BS 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Cik Nordiana Rajaee		

- Arahan**
(Instruction)
1. **Jawab TIGA soalan sahaja.**
(Answer THREE questions only).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

A voltage-controlled oscillator (VCO) is a circuit that provides a varying output signal of square-wave or triangular-wave, whose frequency can be adjusted over a range controlled by dc voltage. Figure 1 shows a 566 connection as a VCO.

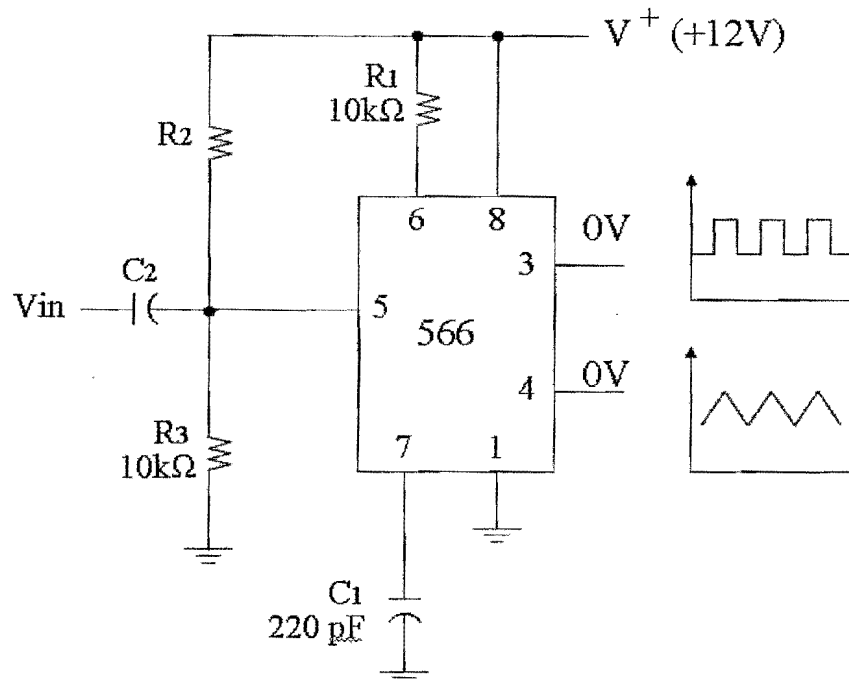


Figure 1

- (a) If the voltage value that enters the circuit at Pin 5 is dc voltage of 4V, how much is the value of R_2 ? [2 marks]
- (b) Referring to (a), state the FOUR conditions for an operational VCO and determine whether the circuit satisfies these conditions. If not, why? [5 marks]
- (c) If V_{in} uses an ac input voltage of 0.8V and the values for V_{con} swing from 9.2V to 10.8V, how much should the value of R_2 be? [3 marks]
- (d) Referring to (c), calculate the center-operating frequency (if any), maximum operating frequency (if any) and minimum operating frequency (if any) of the VCO. [5 marks]

Question 2

- (a) Feedbacks are often implemented in amplifier circuits, and are connected in *shunt-series*, *series-series*, *shunt-shunt* and *series-shunt* connection types. Explain in your own words what does “feedback” actually mean and why it is necessary to have feedbacks in circuits. Relate how different connections characteristics contribute to the most desirable (almost ideal) characteristics of an amplifier. [12 marks]
- (b) For an oscillator to work properly, it has to fulfill the Barkhausen’s Condition whereby the *circuit feedback factor* times the *voltage gain* must equal to 1. Briefly explain the consequences of not fulfilling the condition. [3 marks]

Question 3

From Figure 2, determine the following :

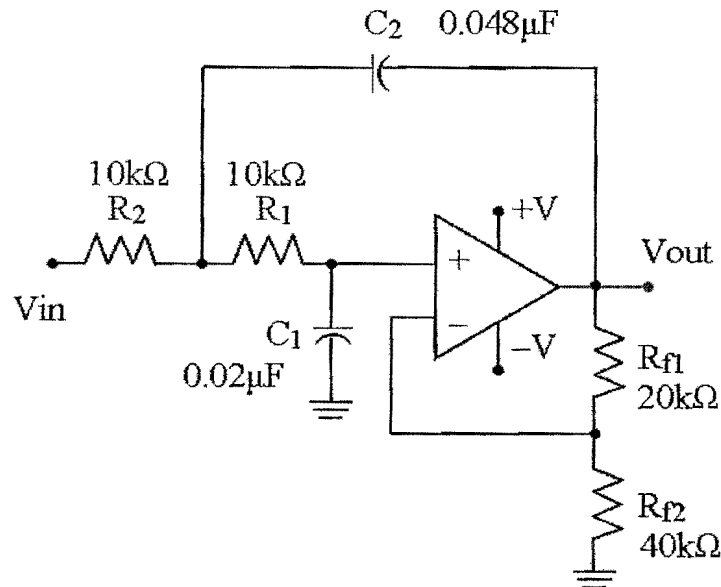


Figure 2

- (a) Closed-loop Gain (A_{CL}) and cutoff frequency of the circuit. [4 marks]
- (b) How would you modify the circuit in Figure 2 to so that it will only allow frequencies higher than the cutoff frequency to pass through? [2 marks]
- (c) Given additional resistors and capacitors $R_a = 15k\Omega$, $R_b = 30k\Omega$, $R_c = 20k\Omega$, $R_d = 40k\Omega$, $C_a = C_b = 0.01\mu F$. Sketch your additions/modifications on Figure 2 to construct a bandpass filter. [3 marks]
- (d) Referring to (c), what are *cutoff frequencies* and *bandwidth* for your bandpass filter? Also, determine its *geometric center frequency* and *Q-value*. [6 marks]

Question 4

- (a) A digital-to-analog converter can be achieved by using Ladder Network. Sketch a ladder network which is able to convert binary values into analog voltage signals. Show the voltage output when the digital input is 27_{10} , $V_{ref} = 16V$ and calculate the voltage resolution of this network. **[4 marks]**
- (b) Identify the circuit in Figure 3 and describe its operation. Discuss the relevance of the circuit operation to its output as shown. **[7 marks]**

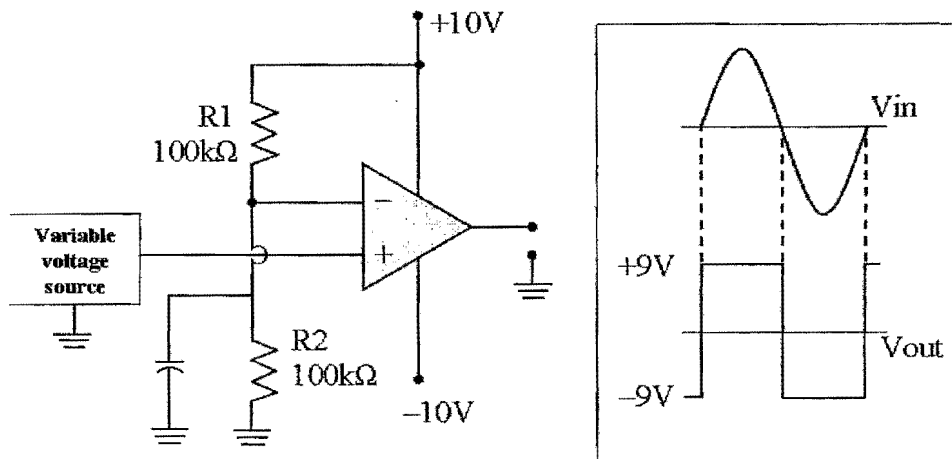


Figure 3

- (c) State two common problems faced by Class B amplifiers and how could we rectify the problem? **[4 marks]**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Teori Maklumat dan Pengekodan
(Information Theory and Error Coding)

KNL 4203

Peperiksaan (Examination)	: Akhir	Tarikh (Date)	: 14 November 2005
Semester	: 1 Sesi 2005/2006	Masa (Time)	: 9:00 – 12:00 p.m.
Tempat (Place)	: DK1	Jangkamasa (Duration)	: 3 jam
Pensyarah (Lecturer)	: Ng Liang Yew		

- Arahan**
(Instruction)
1. **Jawab semua soalan.**
(Answer all questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

Consider a linear ($n=5$, $k=3$) linear binary block code with generator matrix

$$G = \begin{pmatrix} 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{pmatrix}$$

- Write down the seven nonzero codewords for this code. [2 marks]
- Determine a parity-check matrix H for this code. [2 marks]
- Build a syndrome-coset leader table for this code. [3 marks]
- Compute the syndrome for the received vector $[1\ 1\ 1\ 1\ 1]$. Determine what codeword this received vector is decoded into. [3 marks]

Question 2

- In $GF(256)$, suppose α is a primitive element. What is the order of each of the following elements?

$$\alpha^4 \quad \alpha^6 \quad \alpha^{51} \quad \alpha^{17} \quad \alpha^9$$

[10 marks]

Question 3

Define an error-correcting code with 3 bits for the message and 3 check bits by setting $x_4 = (x_1 + x_2 + 1) \bmod 2$, $x_5 = (x_1 + x_3 + 1) \bmod 2$, $x_6 = (x_2 + x_3 + 1) \bmod 2$.

- List all codewords. Is the code linear? Explain. [3 marks]
- The minimal distance between any two codewords is 3 (you do not have to check that). How many errors can the code correct? Explain. [2 marks]
- Show that the code is not perfect by counting the number of words that can be corrected. Give an example of a word that cannot be corrected. [5 marks]

Question 4

This problem concerns the Galois Field $GF(11) = \{ 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$ and polynomials over this field.

- a. Compute 7^{-1} as an element of the field $GF(11)$. [3 marks]

- b. Factor the polynomial $x^2 + 2x + 3$ in the form

$$x^2 + 2x + 3 = (x - a)(x - b)$$

where a, b are members of the field $GF(11)$. [4 marks]

- c. Show that the polynomial $x^2 + 9$ is irreducible in $GF(11)[x]$. [3 marks]

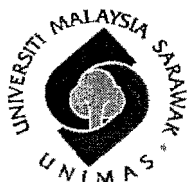
Question 5

Consider the polynomial $x^{15} - 1$ in $GF(2)[x]$

- a. Factor this polynomial completely into irreducible polynomials in $GF(2)[x]$. [4 marks]

- b. Use the factorization in part (a) to identify a divisor $g(x)$ of $x^{15} - 1$ of smallest possible degree which is the generator polynomial of a double-error correcting cyclic code. [3 marks]

- c. The polynomial $g(x)$ found in part (b) is the generator Polynomial of a (n, k) cyclic code. What is n and what is k ? [3 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN

(Faculty of Engineering)

Teknologi Kejuruteraan Elektrik

(Electrical Engineering Technology)

KNL 1233

Peperiksaan : AKHIR
(Examination)

Tarikh : 11 November, 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 9.00 a.m – 12.00 p.m
(Time)

Tempat : Bilik Seminar 11 & 12
(Place)

Jangkamasa : 3 jam
(Duration)

Pensyarah : EN THELAHA BIN MASRI
(Lecturer)

Arahan : 1.
(Instruction)

Jawab semua soalan
(Answer all questions)

2. Baca soalan dengan teliti sebelum menjawab.
(Read the questions carefully before answering)

3. Tulis jawapan hanya di dalam kertas soalan/jawapan yang disediakan menggunakan pen sahaja.
(Write the answers only in the question /answer sheets provided using only pen)

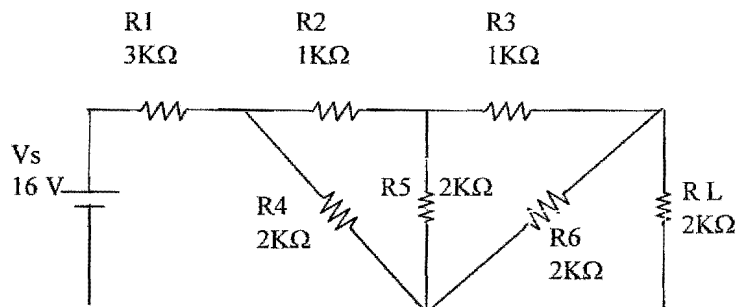
4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.
(No talking or disturbing other candidates during the duration of test)

5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

Answer all questions.

Question 1

- (a) For the circuit below, find the total Conductance, G_t



[5 marks]

- (b) Find the capacitance, C , of a capacitor with a voltage drop of 30 V and a charge of 6 Coulombs.

[4marks]

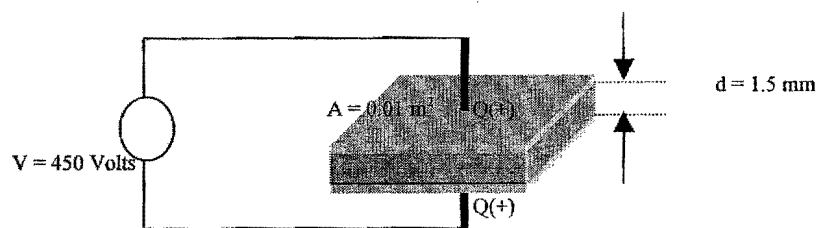
- (c) What is the mutual inductance when $k = 0.75$, $L_1 = 1\mu\text{H}$, and $L_2 = 4\mu\text{H}$?

[5 marks]

- (d) A sheet of mica (dielectric constant of 5.0) 1.5 mm thick having the area of 0.01 m^2 , is inserted between the plate shown in the diagram below.

- I. Find the electric field strength between the plates.
- II. Find the charge on each plate.
- III. Find the capacitance.

[6 marks]



Question 2

(a) In an AC circuit, explain what is;

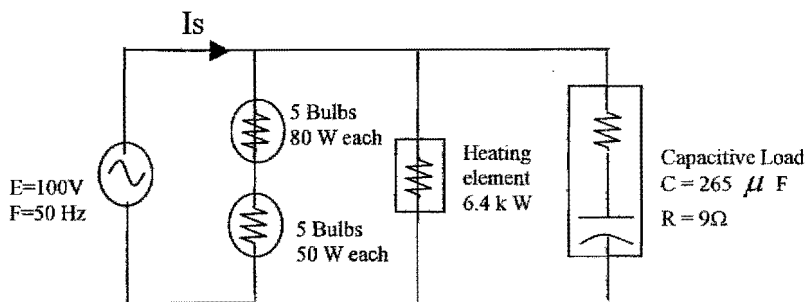
- i. True power
- ii. Reactive power
- iii. Apparent power
- iv. Power factor

[8 marks]

(b) For the circuit given below,

- i. Find the average power, apparent power, reactive power and its power factor at each branch.
- ii. Find the total number of watts, voltage –amperes reactive and voltage-ampere and the power factor of the system, and
- iii. Find the source current, I_s .

[12 marks]



Question 3

(a) What is Hysteresis and illustrate the development of the hysteresis curve.

[8 marks]

(b) Define retentivity.

[2 marks]

(c) A 1-phase transformer has 500 turns in the primary and 50 turns on the secondary. The mean length of flux in the core is 0.5 m. If the maximum flux density is 1.0 Tesla when a potential different is 500 V, 50 Hz is applied to the primary, calculate:

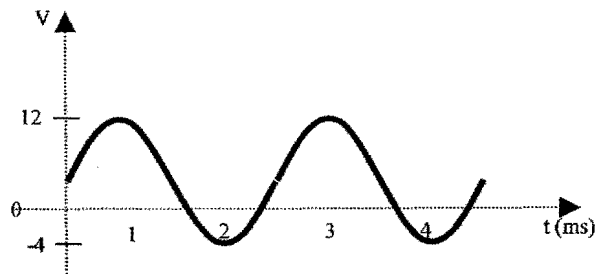
[10 marks]

- I. Maximum cross sectional area of the core
- II. Secondary voltage on no load
- III. Primary current and power factor on no load.

Consider that the iron loss is 250Watt and given that $H(A/m) = 350$ at $B=1$ Tesla.

Question 4

- (a) For the sine wave shown below, find the following values. Show your workouts.



- Average ($V_{dc} = V_{ave}$)
- Peak ($V_p = V_{max}$)
- Peak to peak (V_{pp})
- Minimum (V_{min})
- RMS of the AC only (V_{rms})
- RMS of the total signal (V_{rms})
- Frequency = f
- Period = T

[18 marks]

- (b) Is the wave (in the diagram) an alternating or non-alternating wave? Explain why.

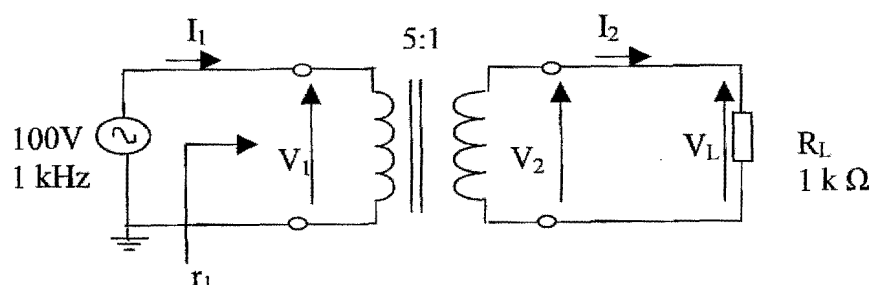
[2 marks]

Question 5

- (a) Describe how a transformer is constructed and how it operates.

[5 marks]

- (b) An Ideal Transformer

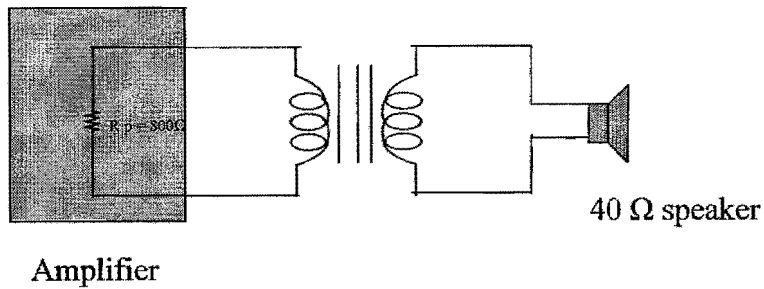


From the diagram above, find;

- V_1 and V_2
- V_L and I_2
- I_1
- AC primary reflected resistance, r_1 .

[8 marks]

- (c) Explain the purpose of impedance matching. [2 marks]
- (d) An Amplifier has an 800Ω internal resistance looking from its output. In order to provide maximum power to a 40Ω speaker, what turns ratio must be used in the coupling transformer?



[5 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Rangkaian Komputer dan Data
(Data and Computer Networking)

KNL 3333/KNL 4193

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 9 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 pm – 5.00 pm
Tempat <i>(Place)</i>	: Bilik Seminar 11 & 12	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Sakena Abdul Jabar		

- Arahan**
(Instruction)
- 1. Jawab SEMUA soalan.**
(Answer ALL questions).
 - 2. Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 - 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 - 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 - 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).--

Question 1

- a. What is the additional feature of MODEM V.92? [2 marks]
- b. Given a bandwidth of 20,000 Hz (1,000 to 21,000), draw the full duplex amplitude shift keying (ASK) diagram of system. Find the carriers and the bandwidths in each direction. Assume there is no gap between the bands in the two directions. [8 marks]

Question 2

- a. What is the relationship between the number of slots in a frame and number of input lines for time division multiplexing (TDM)? [2 marks]
- b. A multiplexer combines eight, 100 Kbps channel using a time slot of 4 bits. Show the output with eight inputs. Calculate [8 marks]
 - (i) frame rate
 - (ii) frame duration
 - (iii) bit rate
 - (iv) bit duration

Question 3

- a. Draw the constellation diagram for 16 quadrature amplitude modulation (QAM) with 3 amplitudes 12 phases. Compute the bit rate for 1000 baud 16 QAM? [4marks]
- b. State the common Fast Ethernet implementation. Compare the different Fast Ethernet implementations based on media and encoding method. [6 marks]

Question 4

- a. Find the class of the following internet protocol (IP) address and identify the network address. [2 marks]
 - i) 19.34.21.5
 - ii) 190.12.67.9
- b. Find the netid and hostid of the following IP address. [2 marks]
 - i) 220.34.8.9
 - ii) 23.67.12.1
- c. Define and discuss the types of Bluetooth local area network (LAN). [6 marks]

Question 5

- a. Based on suitable diagram, name the asynchronous transfer mode (ATM) four-layer model. [2 marks]
- b. Describe briefly the function;
 - i) ATM layer [4 marks]
 - ii) ATM adaptation layer (AAL) [4 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

TEKNOLOGI DAN REKABENTUK VLSI
(VLSI Technology and Design)

KNL 4213

Peperiksaan : Akhir
(Examination)

Tarikh : 15 November 2005
(Date)

Semester : 1 Sesi 2005/2006

Masa : 2:00 pm – 5:00 pm
(Time)

Tempat : DK1
(Place)

Jangkamasa : 3 jam
(Duration)

Pensyarah : Norhuzaimin Julai
(Lecturer)

- Arahan** :
(Instruction)
1. **Jawab semua soalan bahagian A dan satu soalan bahagian B.**
(Answer all questions in section A and one question in section B).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Use the following constants unless otherwise stated

V_T	25 mV at room temperature
ϵ_{ox}	3.45×10^{-11} F/m
ϵ_o	8.85×10^{-12} F/m
ϵ_s	1.04×10^{-10} F/m
q	1.6×10^{-19} C
R_{m2}	0.05 Ω /square
$C_{m2-substrate,plate}$	0.009 fF/ μm^2
$C_{m2-substrate,fringe}$	0.02 fF/ μm

$$C_{ox} = \frac{q \epsilon_{ox}}{t_{ox}}$$

Use the following tables where appropriate

Table 4.2 Logical effort of common gates

Gate Type	Number of Inputs				
	1	2	3	4	n
inverter	1				
NAND		4/3	5/3	6/3	$(n+2)/3$
NOR		5/3	7/3	9/3	$(2n+1)/3$
tristate, multiplexer	2	2	2	2	2
XOR, XNOR		4, 4	6, 12, 6	8, 16, 16, 8	

Table 4.3 Parasitic delay of common gates

Gate Type	Number of Inputs				
	1	2	3	4	n
inverter	1				
NAND		2	3	4	n
NOR		2	3	4	n
tristate, multiplexer	2	4	6	8	$2n$

$$\tau_c = \mu_n C_{ox}$$

$$C_{ox} = \frac{\epsilon_{ox}}{t_{ox}}$$

$$t_{ox} = \sqrt{\epsilon_o + \epsilon_s}$$



Section A: Answer All questions.

QUESTION 1

- (a) Figure 1 shows an nMOS inverter driving another nMOS inverter.

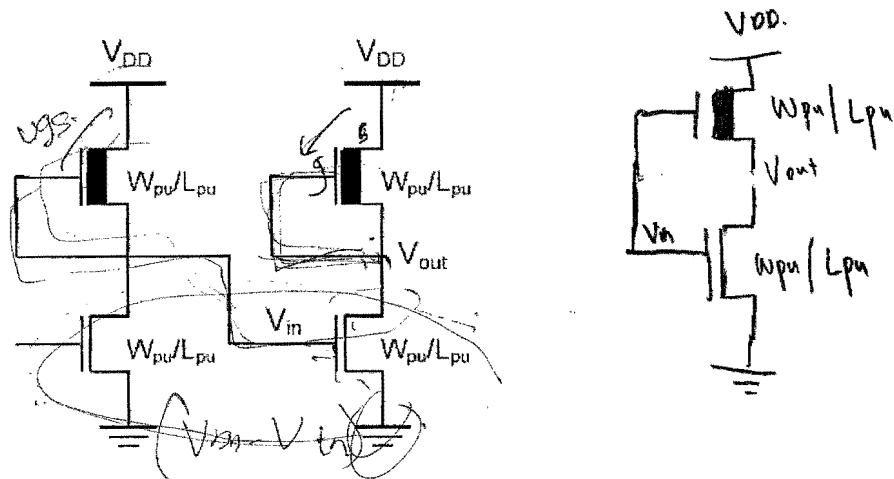


Figure 1

- (i) Determine the pull-up to pull-down transistor sizes ratio $(W_{pu}/L_{pu})/(W_{pd}/L_{pd})$ of the driven gate for equal noise margin i.e. a logic threshold of $0.5V_{DD}$. [5 mark]
- (ii) Draw the stick diagram of the above circuit. Both the inputs and outputs should ideally be on the polysilicon layer. [5 mark]
- (b) Threshold voltage drop causes static power consumption situation is worsened by the body effect since there is SIGNIFICANT source to body voltage when pulling high since the body is tied to GND and the source charges up to V_{DD} . (ie The source terminal is not grounded). With the aids of the appropriate diagram(s), explain two solutions to improve the situations. [10 mark]

QUESTION 2

- (a) Consider a cascade buffer that drive a load capacitance of 50 pF if $C_0 = 50$ fF.

- (i) What is the optimum number of stages, N

- (ii) Calculate the effective fan-out, f

- (iii) Calculate the time delay in term of t_{p0}

- (iv) Design a cascade buffer

$N = 7$ [2 mark]

$f = \frac{C_L}{C_0}$ [2 mark]

$f_1 = t_{p0} (1 + \frac{N}{8})$ [4 mark]

$W^F = 720 f^{\frac{1}{N}} \sqrt{SULIT}$

- (b) Consider four design of a 6-input AND gate shown in figure 2. [10 mark]
Develop an expression for the delay of each path if the path electrical effort is H . What design is fastest for

- (i) $H=1$
(ii) $H=5$
(iii) $H=20$

$$D = t_{p0} \left(\sum p_i + \left(\frac{N^N \sqrt{H}}{\gamma} \right) \right)$$

Explain your conclusions intuitively.

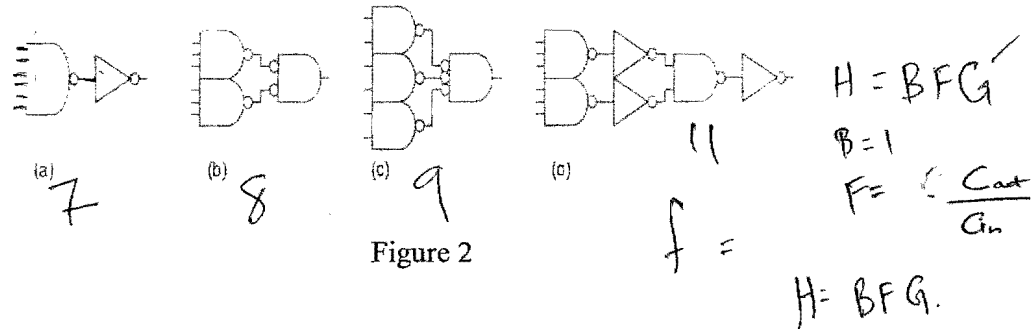


Figure 2

QUESTION 3

Draw a CMOS transistor-level schematic and its an optimum layout stick diagram for the following logic functions.

(a) $X = \overline{(A B + C)}$

$$g = g_1 \times g_2$$

[10 mark]

(b) $Y = \overline{(AB + CD)}$

[10 mark]

QUESTION 4

- (a) Consider an isolated 2mm long and $1\mu\text{m}$ wide M1 (Metal) wire over a silicon substrate driven by an inverter that has zero resistance and parasitic output capacitance. How will the wire delay change for the following cases? Explain your reasoning in each case.

- (i) If the wire width is doubled.

$$p = 0$$

[2 mark]

- (ii) If the wire length is halved.

$$C = \text{parasitic}$$

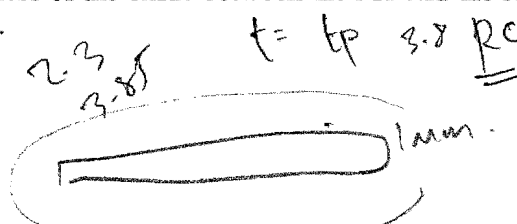
[2 mark]

- (iii) If the wire thickness is doubled.

[2 mark]

- (iv) If thickness of the oxide between the M1 and the substrate is doubled.

[2 mark]



$$\begin{aligned} 1\text{mm} \times n &= \\ 2\text{m} \times n &= 1\text{mm} \\ n &= \frac{1\mu\text{m}}{2\text{m}} \end{aligned}$$

$$\begin{aligned} 5 \text{ } \omega \mu\text{m} \\ 0.5 \text{ mm} \end{aligned}$$

- (b) Consider the routing wire of metal 2 (m2) in Figure 3.

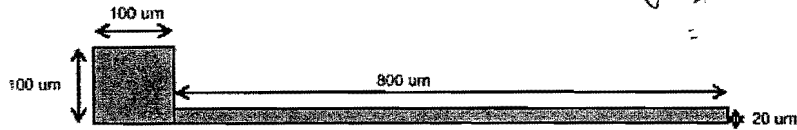


Figure 3

- (i) Estimate the total parasitic resistance and capacitance of the metal 2 (m2) routing wire. [6 mark]
- (ii) Estimate the total delay for a signal transmitted along the above wire (assume a lumped capacitance model). [6 mark]

Bahagian B

QUESTION 5

Design a four-input AND/NAND gate using Complementary Pass-Transistor Logic (CPL). Sketch its schematic and optimum layout stick diagram. [20 marks]

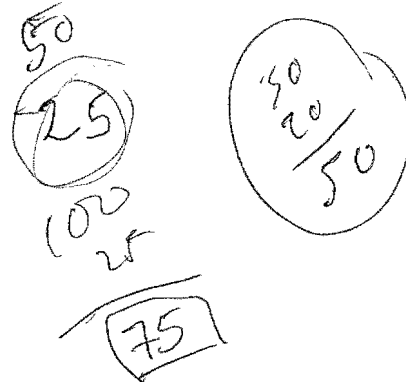
QUESTION 6

- (a) Consider a CMOS logic gate that implements the function

$$X = \overline{(AB + C)}$$

- (i) Design the logic circuit [5 mark]
- (ii) An inverter with $\beta_n = \beta_p$ is used as a sizing reference. Find the device size in the gate if we choose to equalize the nFET and pFET resistances. [5 mark]

$$\tau_{50\%} = \tau$$



- (b) Consider the CMOS logic circuit in Figure 4, which is a simple domino circuit. Node X is connected to a CMOS inverter so that the output can be directly fed to the next stage of the domino circuit.

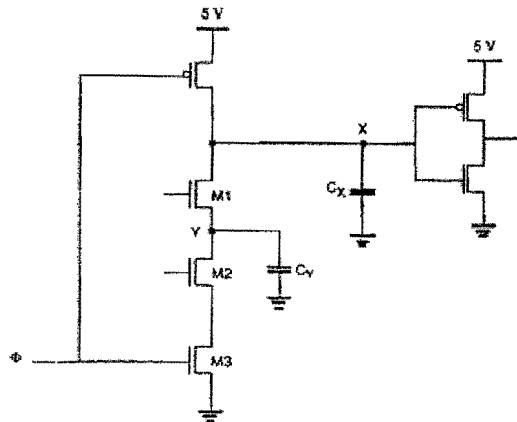


Figure 4

- (i) Explain how the voltage level at node X, after it is pre-charge to 5 V, can be affected by the charge sharing between node X and node Y if their node capacitance are the same. [5 mark]
- (ii) Express the final voltage at node X in terms of the initial voltage at node Y when the charge sharing is completed, following the full pre-charge operation when the gate terminal of transistor M2 is fixed at 0 V. [5 mark]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Teori Litar
(Circuit Theory)

KNL 1023

Peperiksaan (Examination)	:	Akhir	Tarikh (Date)	:	15 November 2005
Semester	:	1 Sesi 2005/2006	Masa (Time)	:	2.00 p.m-5.00 p.m
Tempat (Place)	:	BS 11/ BS 12	Jangkamasa (Duration)	:	3 jam
Pensyarah (Lecturer)	:	Pn. Siti Kudnie Sahari			

Arahan
(Instruction)

1. **Jawab SEMUA soalan.**
(Answer ALL questions).
2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1 (25 marks)

- a. Use the Mesh-Current Method to find the branch current i_a , i_b and i_c in the circuit in **Figure 1**.

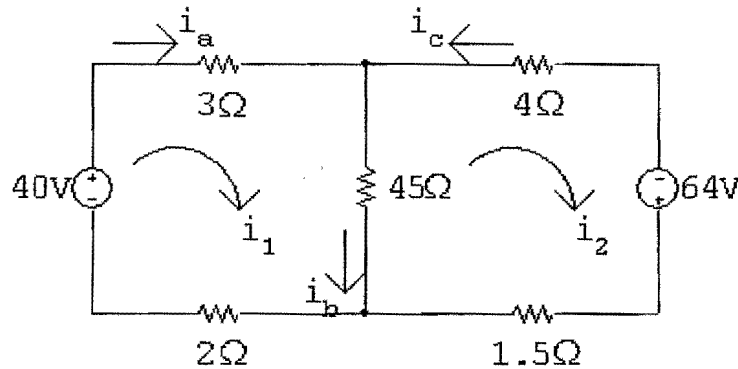


Figure 1

[12 marks]

- b. Repeat (a) if the polarity of the 64V source is reversed

[13 marks]

Question 2 (25 marks)

- a. Use the principle of superposition to find current i in the circuit in **Figure 2**.

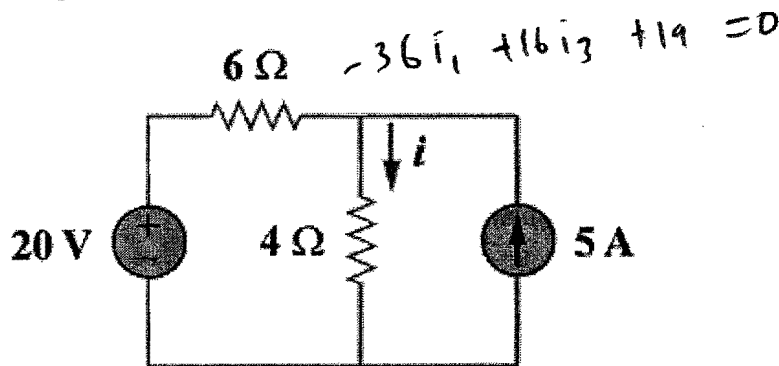


Figure 2

[5 marks]

- b. Determine v_o in the circuit in **Figure 3** using the superposition principle.

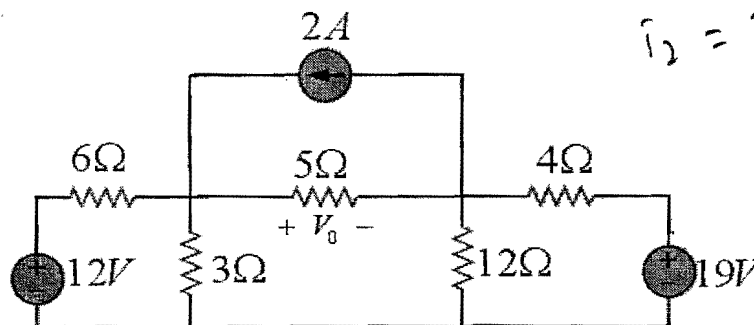


Figure 3

[20 marks]

Question 3 (25 marks)

- a. Find the Thevenin and Norton equivalent circuits at terminal a-b in the circuit of **Figure 4**.

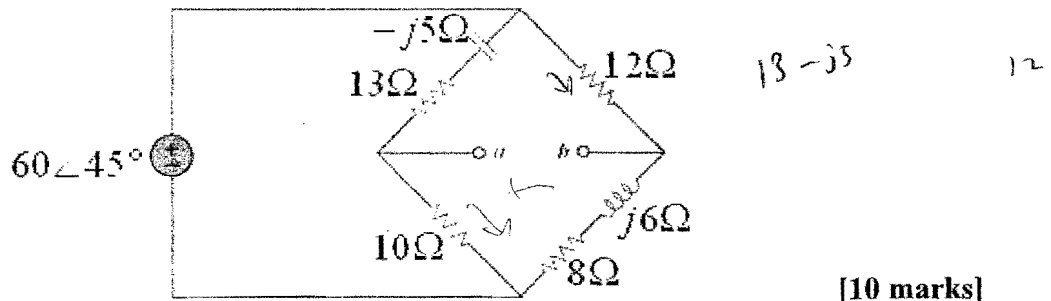


Figure 4

[10 marks]

- b. Solve for $v_o(t)$ in the circuit of **Figure 5** using the superposition principle.

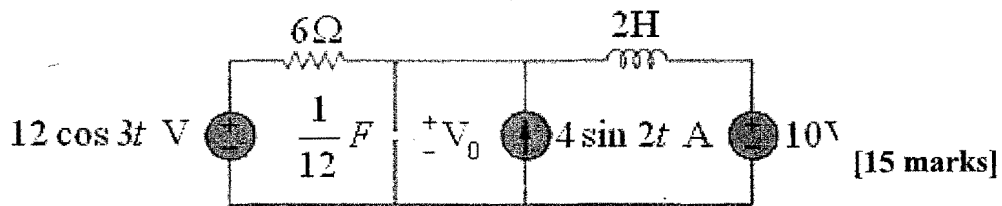
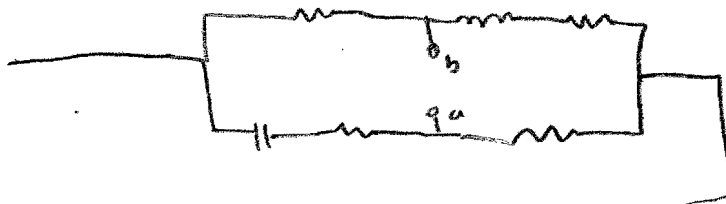


Figure 5

$$(20 + j6) (130 \angle 45^\circ)$$

$$\frac{V - \frac{125}{s^2 + 9}}{6} - \frac{V - 10 - 6}{25 + s^2 + 4} = \frac{V s}{12}$$



$$(\sqrt{436} \angle 16^\circ 41') (10 \sqrt{144} \angle -21^\circ 21') + (\sqrt{554} \angle 12^\circ 16') (120 \angle 36^\circ 52')$$

$$1200 \sqrt{44} \angle 15^\circ 50'$$

$$\left[\left(\frac{1}{8 + j6} + \frac{1}{12} \right) + \right.$$

$$\left. \left(-\frac{1}{13 - j5} + \frac{1}{10} \right) \right]^{-1}$$

Question 4 (25 marks)

- a. Find the node voltages v_1 and v_2 in the circuit of **Figure 6** using Laplace transform technique. Assume that $i_s = 12e^{-t}u(t)$ A and that all initial conditions are zero.

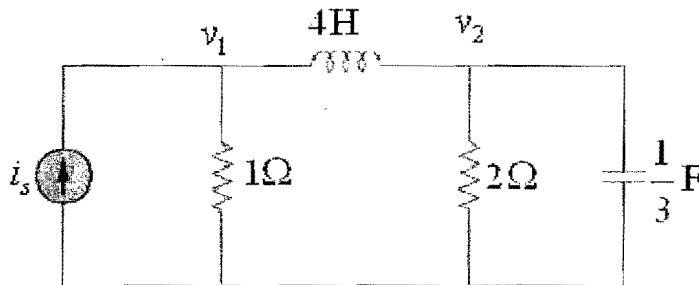


Figure 6

[15 marks]

- b. Determine the hybrid parameters for the network in **Figure 7**.

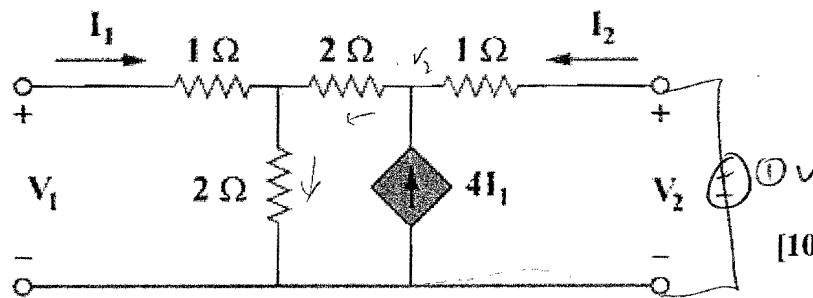


Figure 7

[10 marks]

$$I_2 + 4I_1 = I_3$$

$$I_1 + I_3 = I_4$$

$$V = IR$$

$$Z_{11} = \frac{V_1}{I_1}$$

$$Z_{12} = \frac{V_1}{I_2}$$

$$Z_{21} = \frac{V_2}{I_1}$$

$$Z_{22} = \frac{V_2}{I_2}$$

$$V_2 = I_2 R_1$$

$$I = \frac{V}{R}$$

$$\frac{V_1}{I_1 R}$$

TABLE 18.1 Conversion of two-port parameters.

	z		y		h		g		T		t	
z	z_{11}	z_{12}	$\frac{y_{22}}{\Delta_y}$	$-\frac{y_{12}}{\Delta_y}$	$\frac{\Delta_h}{h_{22}}$	$\frac{h_{12}}{h_{22}}$	$\frac{1}{g_{11}}$	$-\frac{g_{12}}{g_{11}}$	$\frac{A}{C}$	$\frac{\Delta_T}{C}$	$\frac{d}{c}$	$\frac{1}{c}$
	z_{21}	z_{22}	$-\frac{y_{21}}{\Delta_y}$	$\frac{y_{11}}{\Delta_y}$	$-\frac{h_{21}}{h_{22}}$	$\frac{1}{h_{22}}$	$\frac{g_{21}}{g_{11}}$	$\frac{\Delta_g}{g_{11}}$	$\frac{1}{C}$	$\frac{D}{C}$	$\frac{\Delta_t}{c}$	$\frac{a}{c}$
y	$\frac{z_{22}}{\Delta_z}$	$-\frac{z_{12}}{\Delta_z}$	y_{11}	y_{12}	$\frac{1}{h_{11}}$	$-\frac{h_{12}}{h_{11}}$	$\frac{\Delta_g}{g_{22}}$	$\frac{g_{12}}{g_{22}}$	$\frac{D}{B}$	$-\frac{\Delta_T}{B}$	$\frac{a}{b}$	$-\frac{1}{b}$
	$-\frac{z_{21}}{\Delta_z}$	$\frac{z_{11}}{\Delta_z}$	y_{21}	y_{22}	$\frac{h_{21}}{h_{11}}$	$\frac{\Delta_h}{h_{11}}$	$-\frac{g_{21}}{g_{22}}$	$\frac{1}{g_{22}}$	$-\frac{1}{B}$	$\frac{A}{B}$	$-\frac{\Delta_t}{b}$	$\frac{d}{b}$
h	$\frac{\Delta_z}{z_{22}}$	$\frac{z_{12}}{z_{22}}$	$\frac{1}{y_{11}}$	$-\frac{y_{12}}{y_{11}}$	h_{11}	h_{12}	$\frac{g_{22}}{\Delta_g}$	$-\frac{g_{12}}{\Delta_g}$	$\frac{B}{D}$	$\frac{\Delta_T}{D}$	$\frac{b}{a}$	$\frac{1}{a}$
	$-\frac{z_{21}}{z_{22}}$	$\frac{1}{z_{22}}$	$\frac{y_{21}}{y_{11}}$	$\frac{\Delta_y}{y_{11}}$	h_{21}	h_{22}	$-\frac{g_{21}}{\Delta_g}$	$\frac{g_{11}}{\Delta_g}$	$-\frac{1}{D}$	$\frac{C}{D}$	$\frac{\Delta_t}{a}$	$\frac{c}{a}$
g	$\frac{1}{z_{11}}$	$-\frac{z_{12}}{z_{11}}$	$\frac{\Delta_y}{y_{22}}$	$\frac{y_{12}}{y_{22}}$	$\frac{h_{22}}{\Delta_h}$	$-\frac{h_{12}}{\Delta_h}$	g_{11}	g_{12}	$\frac{C}{A}$	$-\frac{\Delta_T}{A}$	$\frac{c}{d}$	$-\frac{1}{d}$
	$\frac{z_{21}}{z_{11}}$	$\frac{\Delta_z}{z_{11}}$	$-\frac{y_{21}}{y_{22}}$	$\frac{1}{y_{22}}$	$-\frac{h_{21}}{\Delta_h}$	$\frac{h_{11}}{\Delta_h}$	g_{21}	g_{22}	$\frac{1}{A}$	$\frac{B}{A}$	$\frac{\Delta_t}{d}$	$-\frac{b}{d}$
T	$\frac{z_{11}}{z_{21}}$	$\frac{\Delta_z}{z_{21}}$	$-\frac{y_{22}}{y_{21}}$	$-\frac{1}{y_{21}}$	$-\frac{\Delta_h}{h_{21}}$	$-\frac{h_{11}}{h_{21}}$	$\frac{1}{g_{21}}$	$\frac{g_{22}}{g_{21}}$	A	B	$\frac{d}{\Delta_t}$	$\frac{b}{\Delta_t}$
	$\frac{1}{z_{21}}$	$\frac{z_{22}}{z_{21}}$	$-\frac{\Delta_y}{y_{21}}$	$-\frac{y_{11}}{y_{21}}$	$-\frac{h_{22}}{h_{21}}$	$-\frac{1}{h_{21}}$	$\frac{g_{11}}{g_{21}}$	$\frac{\Delta_g}{g_{21}}$	C	D	$\frac{c}{\Delta_t}$	$\frac{a}{\Delta_t}$
t	$\frac{z_{22}}{z_{12}}$	$\frac{\Delta_z}{z_{12}}$	$-\frac{y_{11}}{y_{12}}$	$-\frac{1}{y_{12}}$	$\frac{1}{h_{12}}$	$\frac{h_{11}}{h_{12}}$	$-\frac{\Delta_g}{g_{12}}$	$-\frac{g_{22}}{g_{12}}$	$\frac{D}{\Delta_T}$	$\frac{B}{\Delta_T}$	a	b
	$\frac{1}{z_{12}}$	$\frac{z_{11}}{z_{12}}$	$-\frac{\Delta_y}{y_{12}}$	$-\frac{y_{22}}{y_{12}}$	$\frac{h_{22}}{h_{12}}$	$\frac{\Delta_h}{h_{12}}$	$-\frac{g_{11}}{g_{12}}$	$-\frac{1}{g_{12}}$	$\frac{C}{\Delta_T}$	$\frac{A}{\Delta_T}$	c	d

$\Delta_z = z_{11}z_{22} - z_{12}z_{21}, \quad \Delta_h = h_{11}h_{22} - h_{12}h_{21}, \quad \Delta_T = AD - BC$
 $\Delta_y = y_{11}y_{22} - y_{12}y_{21}, \quad \Delta_g = g_{11}g_{22} - g_{12}g_{21}, \quad \Delta_t = ad - bc$

$h_{11} = \infty$
 $h_{12} = 1$
 $h_{21} = -1$
 $h_{22} = \frac{1}{2}$

Function	Time Domain ($t > 0$) $f(t)$	Frequency Domain $F(s)$
Constant Multiplication	$a f(t)$	$a F(s)$
Linearity	$a f(t) + b g(t)$	$a F(s) + b G(s)$
Differentiation	$\frac{d f(t)}{dt}$	$s F(s) - f(0)$
Integration	$\int_0^\infty f(t) dt$	$\frac{F(s)}{s}$
Time Shifting	$f(t-a) u(t-a)$	$e^{-as} F(s)$
Frequency Shifting	$e^{-at} g(t)$	$F(s+a)$
Time Scaling	$f(at)$	$\frac{1}{a} F\left(\frac{s}{a}\right)$
Frequency Scaling	$\frac{1}{t} f\left(\frac{t}{a}\right)$	$F(as)$
Convolution	$f(t) g(t)$	$F(s) G(s)$

Table 5.1 Some Operational Transforms

Function	Time Domain ($t > 0$) $f(t)$	Frequency Domain $F(s)$
Impulse	$\delta(t)$	1
Unit Step	$u(t)$	$\frac{1}{s}$
Ramp	t	$\frac{1}{s^2}$
Exponential	e^{-at}	$\frac{1}{s+a}$
Sine	$\sin \omega t$	$\frac{\omega}{s^2 + \omega^2}$
Cosine	$\cos \omega t$	$\frac{s}{s^2 + \omega^2}$
Damped Ramp	$t e^{-at}$	$\frac{1}{(s+a)^2}$
Damped Sine	$e^{-at} \sin \omega t$	$\frac{\omega}{(s+a)^2 + \omega^2}$
Damped Cosine	$e^{-at} \cos \omega t$	$\frac{s+a}{(s+a)^2 + \omega^2}$

Table 5.2 Common Laplace Transform Pairs



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Digital Signal Processing
(Pemprosesan Isyarat Digital)

KNL 3313

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 16 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 pagi – 12.00 tghari
Tempat <i>(Place)</i>	: BS 12	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Cik Nordiana Rajae		

- Arahan**
(Instruction)
- 1. Jawab DUA soalan sahaja.**
(Answer TWO questions only.)
 - 2. Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 - 3. Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 - 4. Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 - 5. Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

Question 1

Figure 1 shows Direct Form IIR digital filter.

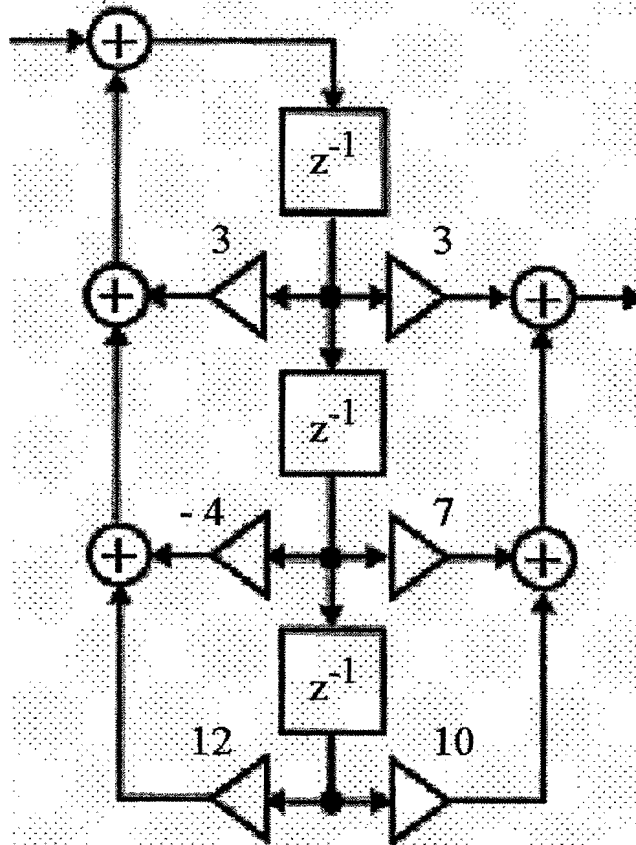


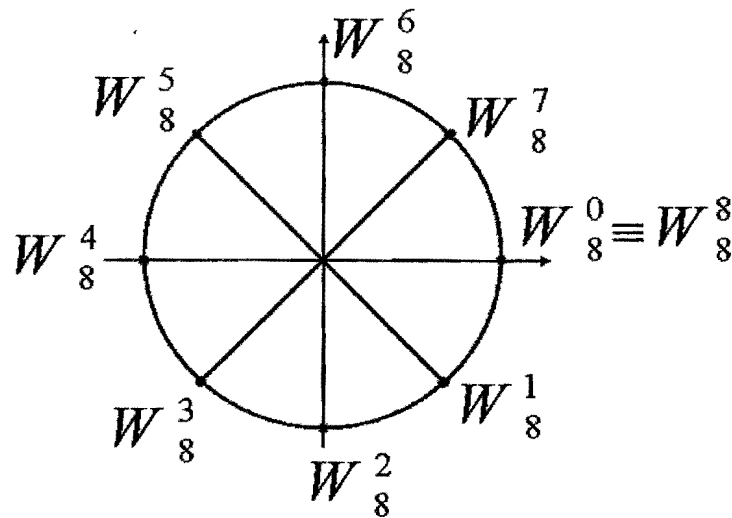
Figure 1

- Derive the transfer function of block diagram in Figure 1. [4 marks]
- Determine whether the structure in Figure 1 is "canonic". Give your reasons. [2 marks]
- Referring to (a), simplify the transfer function into an *equivalent realization* which is realizable into a Cascade Form IIR. Sketch your Cascade Form IIR of equivalent realization. [7 marks]

-
- (d) Briefly explain what you understand by the term “*equivalent realizations*”. [2 marks]
- (e) Why do you think we need to use *equivalent realizations* of a system but in different structures? [4 marks]
- (f) How will the use of infinite precision arithmetic influence the characteristics of different system structures with *equivalent realizations*? [3 marks]
- (g) If a transfer function equation of a system contains 3 poles and 3 zeroes, how many different cascade structures of equivalent realizations can be obtained? [3 marks]

Question 2

An 8-point Discrete Fourier Transform (DFT) can be represented by an Argand Diagram as shown in Figure 2.



Argand Diagram

Figure 2

- (a) From Inverse DFT $x[n] = \frac{1}{N} \sum_{k=0}^{N-1} X[k] \cdot e^{j2\pi nk/N}$ and $W_N = e^{-j2\pi/N}$, derive the Discrete Fourier Transform $X[k]$ in W_N representation. [5 marks]
- (b) Based on your DFT equation in (a), use the equation to illustrate the *matrix interpretation* of Discrete Fourier Transform. [3 marks]
- (c) Compute the value for W_8^5 . [4 marks]
- (d) Fast Fourier Transform (FFT) is a faster and much more powerful algorithm than DFT. Just exactly how much faster is FFT compared to DFT in terms of their number of computations? [3 marks]

- (e) Table 1 shows the optimal block length for a range of N_2 .

[3 marks]

Range of N_2	Optimal Block Length = $N_1 + N_2 - 1$
19 – 26	128
27 – 47	256
48 – 86	512
87 – 158	1024

Table 1

For a filter length for $N_2 = 36$, how much should the length of N_1 be?

- (f) In studying and analyzing signals, why do we choose to use sinusoids over square waves and triangular waves?

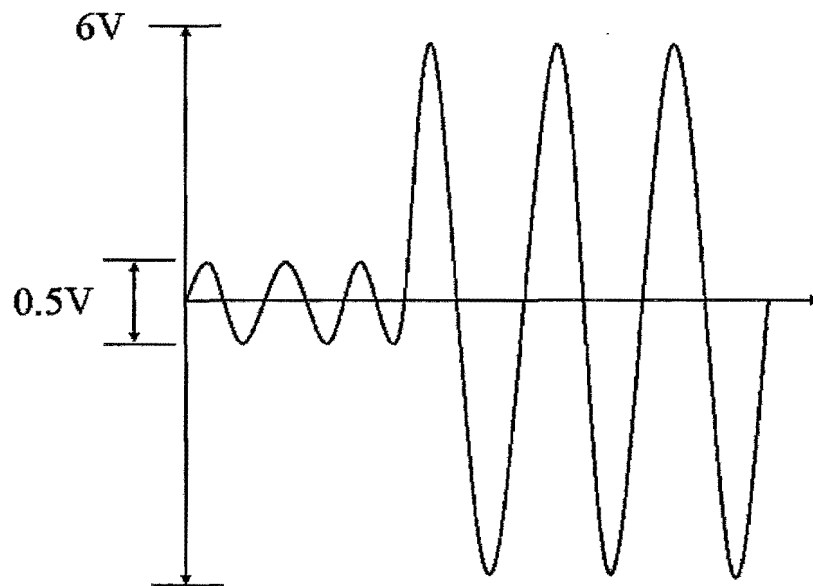
[3 marks]

- (g) Give FOUR differences between FIR and IIR filters.

[4 marks]

Question 3

- (a) A guaranteed signal-to-noise-ratio (SNR) is often required for a signal which may be any amplitude within a given dynamic range. Hence, it is necessary to determine the number of ADC bits required to achieve the SNR for the smallest signal and then the number of additional bits to ensure that the ADC does not saturate for the largest signal. If we wish to produce a SNR of 30dB for the sinewave in Figure 3, how many *number of bits* do we need? And what should the *quantization step size* be?

[6 marks]**Figure 3**

- (b) Design a digital filter equivalent of a 2nd order Butterworth low-pass filter with a cut-off frequency of $f_c = 100$ Hz and sampling frequency of $f_s = 1000$ samples/sec. Derive the *finite difference equation* and draw the *realization structure* of the filter. Given the analogue prototype of the frequency-domain transfer function $H(s)$ for the Butterworth filter is:

[12 marks]

$$H(s) = \frac{1}{s^2 + \sqrt{2} \cdot s} + 1$$

- (c) A common use for multirate signal processing is for sampling-rate conversion where it can be accomplished by L-fold expansion, followed by low-pass filtering and then M-fold decimation. Why do you think it has to be in this particular order? **[3marks]**
- (d) Multirate systems are also being used in CD players when music signals are converted from digital into analogue. However, if the data signals are read from the disk at a sampling rate of 44.1 kHz and converted directly into analogue, the amplifier will overload and severe distortion in music signals will occur. What technique would you suggest solving this problem? And how does it work? **[4 marks]**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Perisian
(Software Engineering)

KNL 2363

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 16 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2:00 – 5:00 p.m.
Tempat <i>(Place)</i>	: BS12	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: Ng Liang Yew		

Arahan <i>(Instruction)</i>	: <ol style="list-style-type: none">Jawab semua soalan. <i>(Answer all questions).</i>Baca soalan dengan teliti sebelum menjawab. <i>(Read the questions carefully before answering).</i>Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja. <i>(Write the answers only in the answer books provided using only pen).</i>Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan. <i>(No talking or disturbing other candidates during the duration of test).</i>Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir. <i>(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).</i>
---------------------------------------	---

Question 1

Give two specific examples of possible (shall not) *emergent properties* of an elevator control system. Be sure to state them as requirements.

[2 marks]

Question 2

Explain in one or two sentences how the waterfall software process model can be accommodated in the spiral process model.

[2 marks]

Question 3

Who should be involved in the review of a requirements document?

[2 marks]

Question 4

Explain in one sentence one reason why it may be necessary to design the system architecture *before* the specifications are completed.

[2 marks]

Question 5

Give one reason why is it important that the responsibility for software quality management reside *outside* the organizational structure in which software products are developed.

[2 marks]

Question 6

- a. Explain how a *Finite State Machine* (FSM) model can be used to provide a specification for a software system, and outline the advantages and disadvantages of such a specification.
- b. A software routine is required to recognise any 3-digit decimal integer. The format of this integer is any number of leading zeros (including no leading zeros) followed by between one and three non-zero decimal digits. A "space" character terminates the number. Thus for example numbers "123 " or "0001 " or "010 " are allowed, but "00 ", "1234" or "01af" are not.
Give a specification based on an FSM model for this recognizer.

[4 marks]

[6 marks]

Question 7

- a. Describe in two sentences what you believe to be the most important difference between the traditional waterfall life-cycle and extreme programming.
- b. What is the main benefit of extreme programming from the customer perspective.
- c. List three activities associated with extreme programming that are especially relevant for a small-team software development project such as a 6-person, two semester student group project.

[4 marks]

[2 marks]

[4 marks]

Question 8

An online music store allows users to download music items, which are either songs or videos. Each user has an account, which has a balance (this is the amount of money in credit). At any stage a user can update the balance in their account by adding credit. When a user buys a music item the price of the item is deducted from the user's balance. Also, since a record is kept of all the items bought by the user, the list of items is updated.

Construct the class diagram by adding all of the attributes, methods, and constructors in the appropriate classes. You should include the return type and arguments of each method and the type of each attribute.

[10 marks]



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Kejuruteraan Sistem Kawalan
(Control System Engineering)

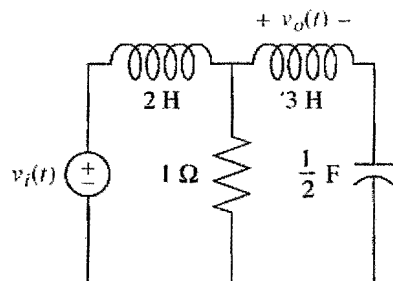
KNL 3324

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 17 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 – 5.00 petang
Tempat <i>(Place)</i>	: BS 23	Jangkamasa <i>(Duration)</i>	: 3 jam
Pensyarah <i>(Lecturer)</i>	: En. David Bong Boon Liang		

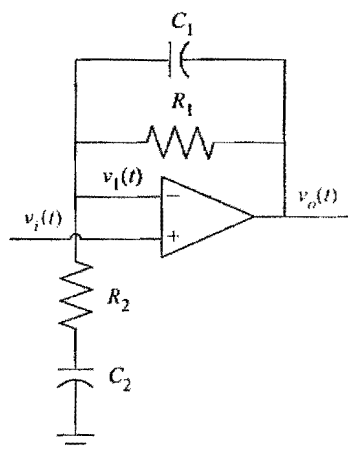
- Arahan**
(Instruction)
1. **Jawab SEMUA soalan.**
(Answer ALL questions).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja. Sebarang graf hendaklah dilukis di dalam kertas graf yang disediakan.**
(Write the answers in the answer books provided using pen only. Graphs must be drawn on the graph papers provided.)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(Do not talk to or disturb other candidates during the test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave the examination room during the first 30 minutes and the last 15 minutes).

Question 1

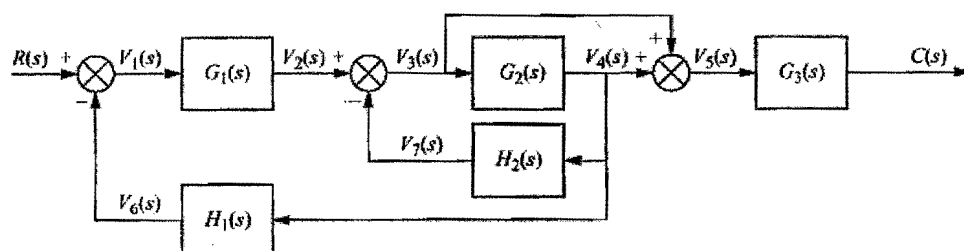
- a. Find the transfer function, $G(s) = V_o(s) / V_i(s)$ for the network shown below. Solve the problem using mesh analysis. **[8 marks]**



- b. Find the transfer function $V_o(s) / V_i(s)$ for noninverting operational amplifier circuit below. **[6 marks]**



- c. Reduce the block diagram below to a single transfer function. **[6 marks]**



Question 2

a.

For $C(s) = \frac{\omega_n^2}{s(s^2 + 2\xi\omega_n s + \omega_n^2)}$, $\xi < 1$

[10 marks]

show how you can find

$$c(t) = 1 - \frac{1}{\sqrt{1-\xi^2}} e^{-\xi\omega_n t} \cos(\omega_n \sqrt{1-\xi^2} t - \phi)$$

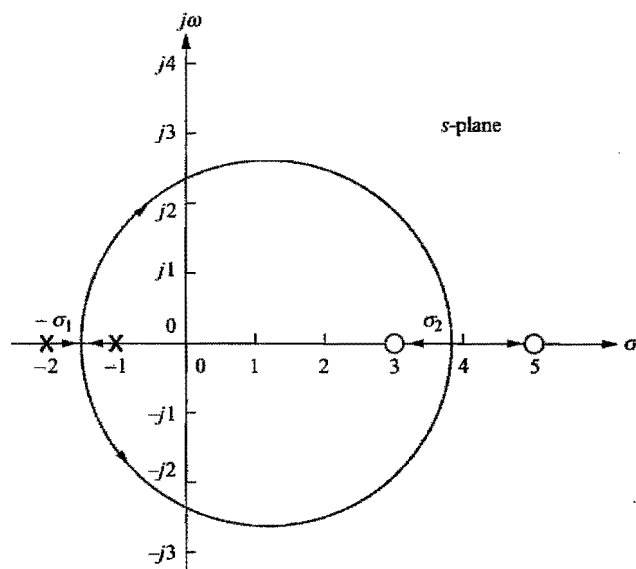
by using partial fractions and inverse Laplace transform.

Find ϕ in terms of ξ .

b. Find the breakaway and break-in points for the root locus below using

[10 marks]

- (i) differential calculus method
- (ii) transition method



Question 3

- a. For a unity feedback system with a forward transfer function

[12 marks]

$$G(s) = \frac{K}{s(s+50)(s+120)}$$

Use frequency response techniques to find the value of gain, K, to yield a closed-loop step response with 20% overshoot.

$$\text{Damping ratio, } \xi = \frac{-\ln(\%OS/100)}{\sqrt{\pi^2 + \ln^2(\%OS/100)}}$$

$$\text{Phase Margin, } \Phi_M = \tan^{-1} \frac{2\xi}{\sqrt{-2\xi^2 + \sqrt{1+4\xi^4}}}$$

- b. For

[8 marks]

$$G(s) = \frac{1}{s^2 + 2\xi\omega_n s + \omega_n^2}$$

- (i) Find G(s) at low and high frequencies.
- (ii) What is the break frequency?
- (iii) Draw the normalized and scaled Bode magnitude and phase plots.

Magnitude plot : $20 \log M\omega_n^2$ vs. $\frac{\omega}{\omega_n}$

Phase plot : Degree vs. $\frac{\omega}{\omega_n}$

where M is magnitude of G(s)

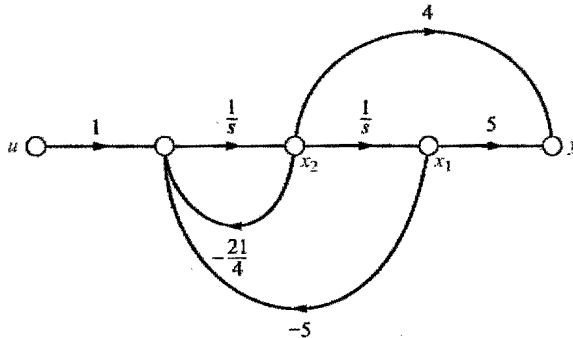
Question 4

- a. Given the open-loop transfer function $G(s)$, where $G(s) = Y(s)/U(s)$, $Y(s)$ is the Laplace transform of the output and $U(s)$ is the Laplace transform of the input control signal **[10 marks]**

$$G(s) = \frac{20(s+2)}{s(s+4)(s+6)}$$

- (i) Draw the signal-flow graph in phase-variable form.
- (ii) Add the state-variable feedback to the signal-flow graph.
- (iii) Design a controller to yield a 10% overshoot and a settling time of 2 seconds. Place the third pole 10 times as far from the imaginary axis as the dominant pole pair. Obtain the new state-space representation and closed-loop transfer function $T(s)$ of the new system.

- b. **[4 marks]**
- (i) What is the rank of the observability matrix for the system below?
 - (ii) Determine whether the system is observable.



- c. For the system $\frac{C(s)}{R(s)} = \frac{(s+3)}{(s+1)^2(s+2)}$ **[6 marks]**

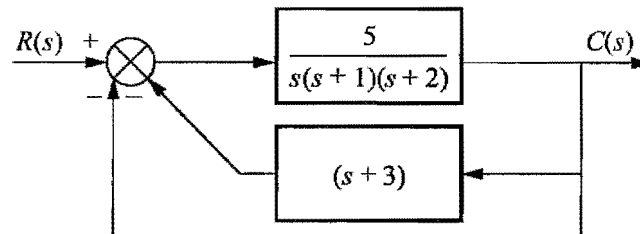
Show the signal-flow graph and state space representation in parallel form.

Question 5

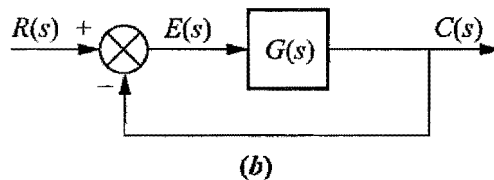
a. For the system shown below, find

[10 marks]

- (i) K_p , K_v and K_a
- (ii) Steady-state error for an input of $50u(t)$, $50tu(t)$ and $50t^2u(t)$
- (iii) The system type



b.



[10 marks]

For the unity feedback system shown above, where

$$G(s) = \frac{K}{s(s+4)(s+8)(s+10)}$$

Find the minimum possible steady-state error if a unit ramp is applied.

Appendix

Laplace Transform
Table

Item no.	$f(t)$	$F(s)$
1.	$\delta(t)$	1
2.	$u(t)$	$\frac{1}{s}$
3.	$tu(t)$	$\frac{1}{s^2}$
4.	$t^n u(t)$	$\frac{n!}{s^{n+1}}$
5.	$e^{-at}u(t)$	$\frac{1}{s+a}$
6.	$\sin \omega t u(t)$	$\frac{\omega}{s^2 + \omega^2}$
7.	$\cos \omega t u(t)$	$\frac{s}{s^2 + \omega^2}$

Laplace Transform
Theorem

Item no.	Theorem	Name
1.	$\mathcal{L}[f(t)] = F(s) = \int_{0-}^{\infty} f(t)e^{-st} dt$	Definition
2.	$\mathcal{L}[kf(t)] = kF(s)$	Linearity theorem
3.	$\mathcal{L}[f_1(t) + f_2(t)] = F_1(s) + F_2(s)$	Linearity theorem
4.	$\mathcal{L}[e^{-at}f(t)] = F(s+a)$	Frequency shift theorem
5.	$\mathcal{L}[f(t-T)] = e^{-sT}F(s)$	Time shift theorem
6.	$\mathcal{L}[f(at)] = \frac{1}{a}F\left(\frac{s}{a}\right)$	Scaling theorem
7.	$\mathcal{L}\left[\frac{df}{dt}\right] = sF(s) - f(0-)$	Differentiation theorem
8.	$\mathcal{L}\left[\frac{d^2f}{dt^2}\right] = s^2F(s) - sf(0-) - \dot{f}(0-)$	Differentiation theorem
9.	$\mathcal{L}\left[\frac{d^nf}{dt^n}\right] = s^nF(s) - \sum_{k=1}^n s^{n-k}f^{(k-1)}(0-)$	Differentiation theorem
10.	$\mathcal{L}\left[\int_{0-}^t f(\tau) d\tau\right] = \frac{F(s)}{s}$	Integration theorem
11.	$f(\infty) = \lim_{s \rightarrow 0} sF(s)$	Final value theorem ¹
12.	$f(0+) = \lim_{s \rightarrow \infty} sF(s)$	Initial value theorem ²

¹ For this theorem to yield correct finite results, all roots of the denominator of $F(s)$ must have negative real parts and no more than one can be at the origin.

² For this theorem to be valid, $f(t)$ must be continuous or have a step discontinuity at $t = 0$ (i.e., no impulses or their derivatives at $t = 0$).

KURSUS GENERIK (TMX & SSX)

**FAKULTI
KEJURUTERAAN**



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

Komputan Pengguna
(End User Computing)

TMX 1011

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 7 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 9.00 am – 10.30 am
Tempat <i>(Place)</i>	: Dewan Kuliah, CTF 1	Jangkamasa <i>(Duration)</i>	: 1 ½ jam
Pensyarah <i>(Lecturer)</i>	: Nadianatra Musa (FSKTM)		

- Arahan**
(Instruction)
1. **Jawab SEMUA soalan di Bahagian A dan B.**
(Answer ALL questions in Section A and B).
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering).
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen).
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test).
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes).

BAHAGIAN A : SOALAN ANEKA PILIHAN (80 Markah)**SECTION A : MULTIPLE CHOICES (80 Marks)****ARAHAN : Jawab SEMUA soalan.****INSTRUCTION : Answer ALL questions**

1. **Kitaran pemprosesan maklumat termasuk _____**
Information processing cycle includes _____

- A. Process
- B. Storage
- C. Communication
- ☒ D. All of the above

(1 markah / mark)

2. _____ **ialah satu koleksi halaman yang berkaitan.**
A _____ is a collection of related pages.

- A. web page
- ☒ B. web site
- C. web http
- D. web url

(1 markah / mark)

3. **Komputer memproses _____**
Computers process _____

- A. data into information
- B. information into data
- ☒ C. data into instructions
- D. instructions into data

(1 markah / mark)

4. **Cakera keras menyediakan lebih _____**
A hard disk provides much _____

- A. less storage capacity than a floppy disk or Zip disk
- B. less storage capacity than a floppy disk but more than a Zip disk
- C. greater storage capacity than a floppy disk but less than a Zip disk
- ☒ D. greater storage capacity than a floppy disk or Zip disk

(1 markah / mark)

5. _____ **menggabungkan ciri-ciri komputer riba dan kemudahan menggunakan pensel dan kertas**

The _____ combines the features of the traditional notebook computer with the simplicity of pencil and paper

- A. desktop computer
- B. mainframe
- C. tower computer
- ☒ D. tablet PC

(1 markah / mark)

Continued...

6. Di dalam rangkaian, perbezaan utama antara komputer pelayan dan pelanggan ialah pelayan biasanya mempunyai _____.
On a network, the major difference between the server and client computers is that the server ordinarily has _____.
- A. less power, less storage space, and decreased communication capabilities
 - B. less power, less storage space, but expanded communication capabilities
 - C. more power, more storage space, but decreased communication capabilities
 - ☒ D. more power, more storage space, and expanded communication capabilities
- (1 markah / mark)
7. Dua jenis _____ ialah computer meja dan komputer riba.
Two types of _____ are desktop computers and notebook computers.
- ☒ A. personal computers
 - B. mobile computers
 - C. midrange servers
 - D. Mainframes
- (1 markah / mark)
8. Pekerja pembaca meter dan penghantar bungkusan biasanya menggunakan _____ di dalam menjalankan tugas mereka memandangkan mereka bergerak dari satu tempat ke tempat yang lain.
Meter readers and parcel delivery people are likely to use a _____ in their jobs as they move from place to place.
- ☒ A. handheld computer
 - B. midrange server
 - C. chat room
 - D. desktop computer
- (1 markah / mark)
9. _____ mempunyai kebolehan memproses lebih daripada 100 trillion arahan sesaat.
_____ are capable of processing more than 100 trillion instructions in a single second.
- A. Desktop computers
 - B. Notebook computers
 - C. Midrange servers
 - ☒ D. Supercomputers
- (1 markah / mark)
10. Ramai pengguna daripada "small office/home office" (SOHO) mula memasuki arena _____ dan menjalankan perniagaan di dalam Web.
Many small office/home office users (SOHO) are entering the _____ arena and conduct business on the Web.
- ☒ A. e-commerce
 - B. Multimedia
 - C. e-transit
 - D. Multidimensional
- (1 markah / mark)

Continued...

11. Semakin banyak jumlah _____ dimiliki sesebuah komputer, semakin cepat komputer tersebut bertindakbalas.
The more _____ a computer has, the faster it responds.
- A. Hard disk
 - B. Storage
 - C. RAM
 - ☒ D. Processor
- (1 markah / mark)
12. Fungsi cache ialah _____.
Functions of a cache is _____.
- ☒ A. Helps speed computer processes by storing frequently used instructions and data
 - B. Enhances system unit or provides connections to external devices called peripherals
 - C. Nonvolatile memory that can be erased electronically and reprogrammed
 - D. A binary system to recognize the computer data.
- (1 markah / mark)
13. Apa itu memori?
What is memory?
- A. A device that uses multiple processors simultaneously to execute a program faster.
 - B. Electronic components that store instructions, data and results.
 - ☒ C. Electronic components that provide enough different combinations of 0s and 1s to represent 256 individual characters.
 - D. Small piece of semi-conducting material on which integrated circuits are etched.
- (1 markah / mark)
14. Berikut merupakan komponen yang lazim terdapat dalam sistem unit, KECUALI:
The followings are common components inside the system unit, EXCEPT:
- A. Processor
 - B. Ports
 - C. Memory
 - ☒ D. Operating system
- (1 markah / mark)
15. Istilah yang digunakan untuk menerangkan tempat penyimpanan sementara berkelajuan tinggi yang menyimpan data dan arahan-arahan ialah _____.
The term used to describe temporary high-speed storage area that holds data and instructions is _____.
- ☒ A. Register
 - B. System clock
 - C. Processing unit
 - D. Byte
- (1 markah / mark)

Continued...

16. _____ menyambungkan peranti berkelajuan rendah, seperti tetikus, papan kekunci, dan modem.
_____ connects slow-speed devices, such as mouse, keyboard, and modem.
- A. Memory
 - B. Adapter cards
 - ☒ C. Serial port
 - D. Connector
- (1 markah / mark)
17. Saluran yang membenarkan peranti di dalam komputer untuk berkomunikasi dikenali sebagai _____.
A channel that allows devices inside computer to communicate with each other is known as _____.
- A. Registry
 - ☒ B. Bus
 - C. Transport
 - D. USB port
- (1 markah / mark)
18. Fungsi USB port ialah _____.
Function of USB ports is _____.
- A. A channel that allows devices inside computer to communicate with each other.
 - B. To assist processor in performing specific tasks.
 - C. Especially useful for taking notes.
 - ☒ D. To connect up to 127 different peripheral together with a single connector type.
- (1 markah / mark)
19. Lengkapkan pernyataan berikut: "For piggyback".
Complete the following statement: "For piggyback".
- A. Old chip is replaced by the new one
 - ☒ B. New chip is stack on top of the old one
 - C. Chip is on adapter card that plugs into motherboard
 - * D. Allows you to install and remove chips with no force
- (1 markah / mark)
20. _____ bit bersamaan dengan satu bait.
_____ bits is grouped together as one byte.
- A. 10
 - B. 256
 - ☒ C. 8
 - D. 100
- (1 markah / mark)
21. Yang manakah berikut BUKAN merupakan jenis pencetak
Which of the following is NOT the type of printers?
- ☒ A. 24 Dot-Matrix printer.
 - B. ✓ Ink-Jet printer.
 - C. ✓ Laser printer.
 - D. Dual Dot-Matrix printer.
- (1 markah / mark)

Continued...

22. **Resolusi terbaik ialah**

The best resolution is

- A. 800 X 600 pixels
- ☒ B. 1024 X 768 pixels
- C. 800 X 600 bit
- D. 1024 X 768 bit

(1 markah / mark)

23. **Papan kekunci yang mempunyai reka bentuk _____ dapat mengurangkan kecederaan.**
_____ keyboards have a design that reduces the chance of injuries.

- ☒ A. ergonomic.
- B. economy.
- C. eco-friendly.
- D. user-friendly.

(1 markah / mark)

24. **Teknologi tanpa wayar menggunakan protokol**
Wireless technology is using _____ protocol

- A. IEEE 802.11x
- ☒ B. TCP/IP
- C. LAN
- D. WWW

(1 markah / mark)

25. **Yang manakah berikut merupakan kualiti warna terbaik pada skrin?**
Which of the following is the best color quality for screen?

- A. True Color 16 Bit.
- B. 256 Colors.
- C. True Color 32 Bit.
- ☒ D. 128 MB Colors.

(1 markah / mark)

26. **Yang manakah berikut BUKAN jenis alat penunjuk.**
Which of the following is NOT type of pointing devices.

- A. Track ball mouse.
- B. Optical mouse.
- C. Touch pad.
- ☒ D. 3-Button mouse.

(1 markah / mark)

27. **Berikut merupakan contoh input KECUALI**
The following are examples of input EXCEPT

- A. telnet 161.142.89.82
- B. ping Apollo.calm.unimas.my/tmx1011
- C. convert c: /fs: NTFS
- ☒ D. the current date is Wed 09/14/2005.

(1 markah / mark)

Continued...

28. "Video conferencing" dikendalikan pada masa yang ____ di lokasi yang ____
Video conferencing is conducted at ____ time and ____ location.

A. same; same
☒ B. same; different
C. different; same
D. different ; different

(1 markah / mark)

29. ____ merupakan contoh teknologi biometrik.
____ is example of biometric technology.

A. Punch card attendance system to record attendance.
☒ B. Smart access card system to enter door.
C. Identity card for identification purpose.
D. ATM card to perform banking transactions.

(1 markah / mark)

30. **Penyataan yang berikut adalah salah KECUALI**
The following statements are false EXCEPT

A. Data – Information – Process
☒ B. Data – Process – Information.
C. Input – Output – Process.
D. Process – Data – Input.

(1 markah / mark)

31. **Nyatakan DUA jenis perisian system.**
Name the TWO types of system software.

☒ i. Operating systems
ii. Booting systems
☒ iii. Utility programs
iv. Networking operating software
A. i and ii
☒ B. i and iii
C. ii and iii
D. i and iv

(1 markah / mark)

32. **Dalam kebanyakan kes, sistem operasi komputer dipasang dan disimpan di dalam komputer....**

In most cases, the operating system is installed and resides on the computer's

A. Recovery disk
☒ B. Hard disk
C. CD ROM
D. Floppy disk

(1 markah / mark)

Continued...

33. Apakah "Program Cross-platform"?

What is a "Cross-platform Program"?

- A. A program that runs the same on multiple operating systems
- B. A program that runs on one operating system only
- ☒ C. An operating system that runs the same on multiple type of computer
- D. An operating system that runs on mobile computers only

(1 markah / mark)

34. _____ menutup sebarang proses dan program komputer dengan sempurna.

_____ properly closes any open processes and programs on the computer.

- A. Cold booting
- B. Resetting
- C. Warm booting
- ☒ D. Power-on Self Test (POST)

(1 markah / mark)

35. Antara berikut, yang manakah langkah terawal yang akan berlaku apabila komputer dihidupkan?

Which is the following is the earliest step when a PC boots up?

- A. The processor chip finds the ROM chips that contain the BIOS.
- B. The POST results are compared with data in a CMOS chip.
- ☒ C. The BIOS executes a series of tests to make sure the computer hardware is connected and operating properly.
- D. System files are loaded into memory (RAM) from storage and execute.

(1 markah / mark)

36. Bilakah anda menggunakan "Recovery Disk"?

When do you use a Recovery Disk?

- ☒ A. When the computer fails to boot from the hard disk.
- B. When you want to back-up your data.
- C. When the utility program fails to run from the hard disk.
- D. When your floppy disk drive fails to function.

(1 markah / mark)

37. Dengan menggunakan Antaramuka Pengguna Bergrafik, anda boleh...

Using Graphical User Interface (GUI), you will be able to...

- ☒ A. enter commands without having to learn the rules of entering commands.
- B. type commands or press special keys on the keyboard to enter data and instructions.
- C. ☒ interact with menus and visual objects such as buttons and other graphical objects to issue commands
- D. ☒ enter a set of command into the computer called the command language

(1 markah / mark)

38. Sistem pengoperasian yang membenarkan hanya satu pengguna menjalankan satu program pada satu masa dikenali sebagai:

The operating system that allows only one user to run one program at a time is known as:

- A. Single user / multi-tasking
- ☒ B. Single user / single-tasking
- C. Multiple users / single-tasking
- D. Multiple users / multi-tasking

(1 markah / mark)

Continued...

39. Alex sedang mencetak dokumen apabila Najib menghantar dokumennya untuk dicetak pada pencetak yang sama. Dokumen Najib akan dihantar ke _____ sementara menunggu untuk dihantar ke pencetak dan proses ini dikenali sebagai _____.
- Alex was printing his document when Najib sent his documents to the same printer. Najib's items will be sent to a _____ while waiting to be transferred to the printer and this process is known as _____.*

A. spool, buffering
B. random access memory (RAM), queuing
C. buffer, spooling
☒ D. spool, scheduling

(1 markah / mark)

40. Antara berikut, yang manakah adalah fungsi "disk defragmenter"?

Which of the following is the function of a disk defragmenter?

☒ A. Recognizes the file and unused space on a computer's hard disk so the operating system accesses data more quickly and programs run faster.
B. Detects and recognizes both physical and logical problems on a hard disk.
C. Compiles technical information about your computer's hardware and certain system software programs and prepare report outlining any identified problems.
D. Allows user to copy selected files or an entire hard disk to another storage medium.

(1 markah / mark)

41. Untuk mula, komputer mencari _____.

To start up, a computer locates _____.

A. application software in storage and loads it into memory
B. application software in memory and loads it onto storage
C. an operating system in storage and loads it into memory
☒ D. an operating system in memory and loads it onto storage

(1 markah / mark)

42. Peranti simpanan mencapai item dalam _____.

Storage devices access items in _____.

☒ A. thousandths of a second (milliseconds)
B. millionths of a second (microseconds)
C. billionths of a second (nanoseconds)
D. trillionths of a second (picoseconds)

(1 markah / mark)

43. Yang manakah peranti simpanan mengikut masa capaian dari yang paling lambat ke paling cepat adalah betul?

Which of the arrangement of the access time of the storage device from the slowest to the fastest is correct?

A. Hard disk, flashdrives, CD
B. Flash drive, hard disk, CD
C. CD, hard disk, flash drive
☒ D. CD, flash drive, hard disk

(1 markah / mark)

Continued...

44. Apabila aliran elektrik diberhentikan, data di dalam penyimpan yang manakah akan hilang?
When power is switched off, data in which of the following storage will be erased?
- A. Floppy disk
 - ☒ B. Random Access Memory
 - C. Hard disk
 - D. Compact disk
- (1 markah / mark)
45. Cakera keras komputer peribadi sekarang mempunyai kapasiti simpanan dari 40 hingga 300 _____.
Current personal computer hard disks have storage capacities from 40 to 300 _____.
- A. KB
 - ☒ B. GB
 - C. MB
 - D. PB
- (1 markah / mark)
46. Semua berikut merupakan ciri-ciri cakera keras, kecuali _____.
All of the following are characteristics of hard disks, except _____.
- ☒ A. write-protect notch
 - B. read/write head
 - C. sectors and tracks
 - D. capacity
- (1 markah / mark)
47. Cakera optik biasanya menyimpan item di _____.
Optical discs commonly store items in _____.
- A. random locations anywhere between the center of the disc and the edge of the disc
 - B. multiple pie-shaped sections that break a track into arcs
 - ☒ C. a single track that spirals from the center of the disc to the edge of the disc
 - D. multiple concentric tracks from the center of the disc to the edge of the disc
- (1 markah / mark)
48. Teknik simpanan oleh DVD-ROM untuk mencapai kapasiti simpanan yang lebih tinggi daripada CD-Rom ialah _____.
A storage technique that a DVD-ROM can use to achieve a higher storage capacity than a CD-ROM is to _____.
- A. make the disc more dense by packing the pits closer together
 - B. use two layers of pits
 - ☒ C. be double-sided
 - D. all of the above
- (1 markah / mark)

Continued...

49. "Card readers/writers" biasanya disambung ke mana "port" yang berikut di dalam unit system kecuali _____.
Card readers/writers usually connect to any of the following ports on the system unit except the

☒ A. serial port
B. USB port
C. parallel port
D. fireWire port

(1 markah / mark)

50. Penggunaan mikro filem dan mikro fiche membawa kebaikan berikut kecuali _____.
The use of microfilm and microfiche provides all of the following advantages except _____.

A. they greatly reduce the amount of paper firms must hand
☒ B. they are inexpensive
C. they have the longest life of any storage media
D. they can be read without a microfilm or microfiche reader

(1 markah / mark)

51. Di antara yang berikut, yang manakah BUKAN ciri pemproses perkataan?
Which one of the following is NOT a word processing feature?

A. Pagination and footnotes
☒ B. Scrolling
C. Formatting -
D. Editing text blocks ~

(1 markah / mark)

52. Apakah peranti awalan bagi semak semula bacaan?
What are preliminary proof reading devices?

A. Grammar checkers
B. Thesaurus
☒ C. Spelling checkers
D. Pagination

(1 markah / mark)

53. Apakah kaitan istilah "shadow", "bold" dan "italic" dikaitkan dengan?
What do the terms shadow, bold and italic relate to?

☒ A. Font styles
B. Serif fonts
C. Menus and buttons
D. Word wrap ~

(1 markah / mark)

54. Yang manakah di antara berikut pernyataan terbaik mengenai pemproses perkataan?
Which of the following best describes the word processor?

A. * The word processor is the most rarely used application program.
☒ B. Using the word processor wisely takes skill and practice.
C. * The word processor should be seen as glorified typewriter.
D. The word processor offers limited way to deal with documents.

(1 markah / mark)

Continued...

55. Senarai di bawah adalah perbezaan asas bagi kertas taip KECUALI:

Listed below are basic of typing paper with differences EXCEPT:

- A. Scrolling
- ☒ B. Word wrap
- C. Menus and buttons
- D. Format

(1 markah / mark)

56. Apakah ciri bagi "Serif Font":

What is a characteristic of "Serif Font":

- A. Hooks on the ends of characters
- B. Hooks on the above of characters
- C. The characters without hooks
- ☒ D. Using for heading, captions or in small amounts in a larger document.

(1 markah / mark)

57. Blok perkataan perlu ditanda untuk melakukan fungsi :

The text block must be remarked in order to play function as:

- A. Saved
- B. Moved
- ☒ C. Copied
- D. Deleted

(1 markah / mark)

58. Fungsi performatan adalah untuk:

The function of formatting is:

- A. Controlling the physical appearance such alignment.
- B. Controlling the editing text blocks.
- C. Correcting the spelling and grammar checking.
- ☒ D. Scrolling the portions of document.

(1 markah / mark)

59. Dalam pemproses perkataan, pelekatan adalah proses :

In word processing, pasting is the process of:

- A. Moving different portions of the document on the screen into view
- ☒ B. Transferring an item from the clipboard to a specific location in a document
- C. Locating all occurrences of a certain character, word or phrase
- D. Removing a portion of a document and storing it in a temporary storage location

(1 markah / mark)

60. Pengguna mendapati bahawa _____ adalah satu perisian yang memudahkan sewaktu mesyuarat, kuliah dan lain-lain kegunaan di mana dahulu memerlukan pensil dan kertas untuk merekod idea dan perbincangan.

Users find _____ software convenient during meetings, class lectures and other settings that previously required a pencil and paper for recording thoughts and discussions.

- A. Word processing
- ☒ B. Database
- C. Note taking
- D. Accounting

(1 markah / mark)

Continued...

61. Apakah definisi Spreadsheets?

What is the definition of Spreadsheets?

- ☒ A. A spreadsheet is an electronic version of a ledger.
- B. A spreadsheet can be defined as an electronic calendar.
- C. A spreadsheet usually used by teachers as a teaching method.
- D. A spreadsheet is another terminology used in desktop publishing.

(1 markah / mark)

62. Kenyataan berikut adalah benar berkaitan dengan penggunaan "Spreadsheets" KECUALI:

The following statements are true about the uses of Spreadsheets EXCEPT:

- A. ✓ calculate budgets
- B. ✓ analyze scientific data
- ☒ C. analyze research proposals
- D. ✓ forecast loan payments

(1 markah / mark)

63. Kenyataan berikut adalah salah berkaitan dengan kelebihan menggunakan

"Spreadsheets" KECUALI:*The following statements are wrong about the advantages of Spreadsheets EXCEPT:*

- ☒ A. Save time.
- B. More tedious than traditional ledgers.
- C. Have more errors.
- D. Have to manually recalculate values.

(1 markah / mark)

64. Pengiraan Semula Automatik adalah salah satu kelebihan yang terdapat dalam aplikasi Spreadsheet. Manakah antara berikut kenyataan yang paling TEPAT bagi Pengiraan Semula Automatik?

One of the most significant features in Spreadsheets is Automatic Recalculation. What can be best described as Automatic Recalculation?

- A. ✗ This feature waste more time and increases the chance of errors.
- ☒ B. When a value or calculation is changed, all dependent values on the spreadsheet are automatically recalculated to reflect the change.
- C. The values can only be recalculated if the users have the accurate values on their salaries
- D. This feature decreases the amount of money in the users' bank.

(1 markah / mark)

65. Yang manakah antara berikut adalah ciri-ciri asas "Spreadsheets"?

Which one of the followings are basic spreadsheet characteristics?

- I Ranges ✓
- II Cell contents ✓
- III Cell Address ✓
- IV Cellmates
- A. I and II
- B. I and IV
- ☒ C. I, II and III
- D. All of the above.

(1 markah / mark)

Continued...

66. Rajah di bawah menunjukkan salah satu ciri-ciri dalam "Spreadsheets". Apakah ciri B2 tersebut?

The image below shows one of the basic characteristics in Spreadsheets. What does B2 represents?

- ☒ A. Cell address
☐ B. Cell contents
☐ C. Ranges
☐ D. Value

	A	B	C
1			
2		B2	
3			

(1 markah / mark)

67. Yang manakah antara berikut adalah berkaitan dengan kandungan sel?
Which of the followings relates to Cell Contents?

- I. An integer
 II. A value ✓
 III. A Label ✓
 IV. A formula ✓
 A. I and II
 B. III and IV
☒ C. II, III and IV
 D. All of the above.

(1 markah / mark)

68. Terdapat dua jenis program berbentuk grafik perniagaan yang direkabentuk untuk memenuhi keperluan pengguna:

There are two types of business graphics programs are designed to fit user needs:

- I. Analytical graphics ✓
 II. Presentation graphics ✓
 III. Hypothesis graphics
 IV. Architectural graphics
☒ A. I and II
 B. II and III
 C. III and IV
 D. I and IV

(1 markah / mark)

Continued...

69. Penampilan pada sesebuah "worksheet" boleh di perberbaiki bagi tujuan percetakan dengan menukar elemen-elemen berikut KECUALI:

The appearance of the worksheet can be adjusted to improve the look of the printed document by changing all of these EXCEPT:

- A. Margins
- B. Ruler lines
- ☒ C. Orientation
- D. Grid lines

(1 markah / mark)

70. Apakah yang dimaksudkan dengan formula "Spreadsheets"?

What is the meaning of formula used in Spreadsheets?

- ☒ A. A formula is an instruction to the spreadsheet program to calculate a number.
- B. A formula is used to calculate the amount of chemical solutions.
- C. A formula is descriptive text information about entries in the spreadsheet.
- D. A formula is a group of one or more adjacent cells.

(1 markah / mark)

71. _____ nombor atau aksara yang ditambahkan atau dimasukkan ke dalam atas nilai kekunci utama untuk memastikan ketepatan nilai kekunci utama.

_____ number(s) or character(s) appended to or inserted into a primary key value to confirm accuracy of primary key value.

- A. check digit
- ☒ B. alphabetic/numeric check
- C. range check
- D. consistency check

(1 markah / mark)

72. _____ pengguna boleh melihat data, tetapi tidak boleh mengubahnya.

_____ user can view data, but cannot change it.

- A. display privilege
- ☒ B. read privilege
- C. write privilege
- D. update privilege

(1 markah / mark)

73. Apakah itu log?

What is log?

- A. A copy of the entire database
- B. Listing of activities that change database contents
- ☒ C. Activities that specific user can perform
- D. Rules and standards that define how database organizes data

(1 markah / mark)

Continued...

74. Yang manakah diantara berikut BUKAN penyata SQL?

Which of the following is NOT a SQL statement?

- A. SELECT name, age ✓
- B. FROM smp, fin
- C. RUN BY age
- ☒ D. WHERE smp.memberid=fin.memberid

(1 markah / mark)

75. _____ mengenalpasti setiap rekod secara unik.

_____ uniquely identifies each record.

- A. Foreign key
- B. Master key
- C. Primary Key
- ☒ D. Reference Key

(1 markah / mark)

76. Yang manakah antara berikut adalah jenis asas halaman web?

Which ones of these are the basic types of Web sites?

- I. Portal ✓
- II. Informational ✓
- III. News ✓
- IV. Advocacy ✓
- A. I dan II
- B. I dan IV
- C. I, II dan III
- ☒ D. All of the above

(1 markah / mark)

77. Mana-mana halaman web yang tersenarai dalam satu hasil pencarian adalah dikenali sebagai _____.

Any Web site name that is listed as the result of a search is known as _____.

- ☒ A. Hit
- B. Heat
- C. Bit
- D. Thumbnell

(1 markah / mark)

78. Walaupun ia merupakan salah satu cara yang mudah dan murah untuk pengguna menggunakan internet, _____ merupakan teknologi yang berkelajuan perlahan.

Although it is an easy and inexpensive way for users to connect to the Internet, _____ is slow-speed technology.

- A. a cable modem
- B. DSL
- ☒ C. a dial-up connection
- D. ISDN

(1 markah / mark)

Continued...

79. _____ merupakan proses di mana komputer menerima maklumat, contohnya halaman Web, daripada sebuah pelayan dari Internet
_____ is the process of a computer receiving information, such as a Web page, from a server on the Internet
- A. Streaming ✗
☒ B. Downloading
C. Flowing ✗
D. Uploading ✗
- (1 markah / mark)
80. Melalui Web, anda dapat belajar bagaimana kapal terbang beroperasi atau bagaimana menyediakan makanan. Bagi membentuk pengalaman belajar yang lebih teratur, syarikat menawarkan latihan secara online kepada para pekerja, dan kolej pula menawarkan kelas secara online.
Kenyataan di atas tepat menerangkan _____ .
On the Web, you can learn how airplanes fly or how to cook a meal. For a more structured learning experience, companies provide online training to employees, and colleges offer online classes and degrees.
The statements above fit to describe the uses of _____ .
- ☒ A. a portal web
B. an informational web
C. a business / marketing web
D. an educational web
- (1 markah / mark)

Continued...

BAHAGIAN A : BETUL ATAU SALAH (20 Markah)**SECTION B : TRUE OR FALSE (20 Marks)****ARAHAN : Jawab SEMUA soalan.****INSTRUCTION : Answer ALL questions**

81. Connector yang menyambungkan kabel ke peripheral terdapat dalam dua jantina, lelaki dan perempuan.

A connector that joins cable to peripheral is available in two genders, male and female.

- ☐ A. True
☐ B. False

(1 markah / mark)

82. Dalam satu kerdipan mata, komputer dapat melaksanakan sehingga 1 juta operasi dalam tempoh masa yang sama.

In a blink of an eye, a computer can perform up to 1 million operations in the same amount of time.

- ☐ A. True
☒ B. False

(1 markah / mark)

83. Pencetak "ink-jet" merupakan contoh pencetak "nonimpact"

Ink-jet printers are example of nonimpact printer.

- ☒ A. True
☐ B. False

(1 markah / mark)

84. Semua pengguna komputer ialah "power users".

All computer users are power users.

- ☐ A. True
☒ B. False

(1 markah / mark)

85. Semua saiz komputer kebiasaannya menggunakan sistem pengoperasian yang sama

All sizes of computers typically use the same operating system.

- ☐ A. True
☒ B. False

(1 markah / mark)

86. Pengimbas cakera merupakan satu utiliti yang menyusun semula fail-fail dan ruang yang tidak digunakan di cakera keras komputer supaya system pengoperasian dapat mencapai data dengan lebih cepat dan program dilaksanakan dengan pantas.

A disk scanner is a utility that reorganizes the files and unused space on a computer's hard disk so the operating system can accesses data more quickly and programs run faster.

- ☐ A. True
☒ B. False

(1 markah / mark)

Continued...

87. **Pengawal cakera untuk cakera keras, yang dipanggil sebagai pengawal cakera keras, mungkin sebahagian daripada cakera keras atau pun mungkin merupakan kad adapter yang berasingan di dalam unit sistem.**
A disk controller for a hard disk, called the hard disk controller, may be part of a hard disk or may be a separate adapter card inside the system unit.
- ☐ A. True
☒ B. False
- (1 markah / mark)
88. **Pengguna yang melanggan ruang simpanan atas talian boleh menyimpan di cakera keras Internet sama seperti yang dilaksanakan di cakera keras setempat.**
Users who subscribe to online storage can save on the Internet hard disk in the same manner they save on their local hard disk.
- ☒ A. True
☐ B. False
- (1 markah / mark)
89. **Label ialah imej deskriptif dalam spreadsheet**
A label is descriptive images in the spreadsheet.
- ☒ A. True
☐ B. False
- (1 markah / mark)
90. **Carta garisan sangat sesuai untuk menggambarkan pelbagai perbandingan**
Line charts is best for visualizing multiple comparisons.
- ☐ A. True
☒ B. False
- (1 markah / mark)
91. **Halaman Web yang menawarkan pelbagai perkhidmatan (Carian, sukan, email, cuaca, lelongan, komuniti web) dari satu lokasi yang tertentu, secara percuma ialah halaman web Portal.**
*A Web site that offers a variety of services (Search, sports, email, news, weather, auctions, Web communities) from one convenient location, usually for free, is **Portal** type of website.*
- ☐ A. True
☒ B. False
- (1 markah / mark)
92. **Internet ialah "World Wide Web" (WWW).**
Internet is World Wide Web (WWW).
- ☒ A. True
☐ B. False
- (1 markah / mark)
93. **Animasi ialah paparan pergerakan yang dihasilkan dengan memaparkan siri jujukan imej-imej.**
Animation is appearance of motion created by displaying a series of still images in sequence
- ☒ A. True
☐ B. False
- (1 markah / mark)

Continued...

94. **"Newsgroup" merupakan ruang dalam talian di mana pengguna membuat perbincangan bertulis mengenai sesuatu topik.**
A newsgroup is an online area in which users have written discussions about a particular subject.
A. True
☒ B. False
(1 markah / mark)
95. **Setiap "hit" di dalam senarai yang dipulangkan oleh enjin carian mempunyai satu pautan, bila diklik, memaparkan laman web yang berkaitan.**
Each hit in the list returned by a search engine has a link that, when clicked, displays the associated Web site or Web page.
☒ A. True
B. False
(1 markah / mark)
96. **Ruang di antara satu abjad hanya yang boleh ditingkatkan sahaja.**
The spacing between individual letters can only be increased
☒ A. True
B. False
(1 markah / mark)
97. **"Artwork" memainkan peranan sebagai fungsi yang sama seperti teks di dalam dokumen desktop penerbitan**
The artwork able to play function same as text in a desktop published document
A. True
☒ B. False
(1 markah / mark)
98. **Sistem pengoperasian menyediakan kaedah kepada pengguna untuk berkomunikasi dengan komputer dan perisian**
The operating system provides a method for users to communicate with the computer and other software
☒ A. True
B. False
(1 markah / mark)
99. **Apabila pengguna mula menggunakan komputer, sebahagian daripada pengoperasian system akan dimuatkan pada cakera keras komputer daripada memori.**
When a user starts a computer, portions of the operating system load into the computer's hard disk from memory
A. True
☒ B. False
(1 markah / mark)
100. **Rekod mempunyai medan**
Record contains fields
☒ A. True
B. False
(1 markah / mark)



UNIVERSITI MALAYSIA SARAWAK
94300 KOTA SAMARAHAN
SARAWAK

FAKULTI KEJURUTERAAN
(Faculty of Engineering)

TITAS 1

SSX 0012/0011

Peperiksaan <i>(Examination)</i>	: Akhir	Tarikh <i>(Date)</i>	: 11 November 2005
Semester	: 1 Sesi 2005/2006	Masa <i>(Time)</i>	: 2.00 p.m- 4.00 p.m
Tempat <i>(Place)</i>	: Dewan Kuliah, CTF 1	Jangkamasa <i>(Duration)</i>	: 2 jam
Pensyarah <i>(Lecturer)</i>	: En. Helmi Nahrawi		

- Arahan**
(Instruction)
1. **Jawab semua soalan.**
(Answer all questions)
 2. **Baca soalan dengan teliti sebelum menjawab.**
(Read the questions carefully before answering)
 3. **Tulis jawapan hanya di dalam buku jawapan yang disediakan menggunakan pen sahaja.**
(Write the answers only in the answer books provided using only pen)
 4. **Dilarang bercakap atau mengganggu calon-calon lain di dalam jangkamasa peperiksaan.**
(No talking or disturbing other candidates during the duration of test)
 5. **Calon tidak dibenarkan meninggalkan bilik peperiksaan dalam masa 30 minit pertama dan 15 minit terakhir.**
(Candidates are not allowed to leave during the first 30 minutes and the last 15 minutes)

1. Berikut adalah **maksud tamadun** dari sudut **bahasa Arab** kecuali
 - a) berbudi bahasa
 - b) masyarakat bandar
 - c) sopan santun
 - d) bersatu padu

2. Manakah antara berikut merupakan **elemen-elemen asas** pembentukan tamadun
 - i) penempatan kekal
 - ii) wujud institusi sosial
 - iii) ada undang-undang
 - iv) hanya punyai satu bahasa
 - a) i,ii,iii dan iv
 - b) ii, iii, dan iv
 - c) i, ii dan iii
 - d) i, iii dan iv

3. Secara tipologi tamadun manusia dapat dibahagikan kepada **Empat** ciri utama, antaranya:
 - a) tamadun pertahanan
 - b) tamadun kekal
 - c) tamadun mistik
 - d) tamadun kebenuaan

4. Menurut Dr. Lutpi Ibrahim **tamadun** hendaklah mempunyai 2 asas utama iaitu
 - a) agama dan negara
 - b) Islam dan Ad Din
 - c) alHadharah dan alMadaniah
 - d) Sains dan Teknologi

5. Manakah antara berikut **bukan** merupakan zaman kehidupan Rasulullah SAW?
 - a) Zaman Jahiliah
 - b) Zaman Madinah
 - c) Zaman Mekah
 - d) Zaman Abbasiyah

6. Kerajaan Islam manakah yang pernah **pertama** berkuasa di Cordova?
- a) Abbasiyah
 - b) Umayyah
 - c) Uthmaniyah
 - d) Muawiyah
7. Yang manakah **bukan** merupakan **konsep asas** tamadun Islam?
- a) Konsep Manusia
 - b) Konsep Masyarakat
 - c) Konsep Ketuhanan
 - d) Konsep Sejarah
8. Berikut merupakan **ciri-ciri khusus** Tamadun Islam kecuali?
- a) Syariah
 - b) Akhlak
 - c) Aqidah
 - d) Syahadah
9. Berikut **bukan** merupakan **perbezaan** antara As Sunnah dan Al Quran?
- a) As Sunnah hanya disandarkan kepada Nabi SAW
 - b) Al Quran merupakan kata-kata Allah
 - c) As Sunnah tidak pernah dibukukan di Zaman Rasulullah
 - d) Al Quran disampaikan melalui malaikat Jibrail
10. Pendapat **terawal** mengatakan kedatangan Islam ke Tanah Melayu ialah pada?
- a) Abad 7 – 10
 - b) Abad 13
 - c) Abad 7 Kenabian
 - d) Abad 5

11. Kesemua teori kedatangan Islam ke Tanah Melayu melibatkan perkara-perkara berikut

- | | |
|--------------------|------------------|
| i) Perdagangan | ii) Peperangan |
| iii) Politik | iv) Perkahwinan |
| a) i,ii,iii dan iv | c) i, ii dan iii |
| b) ii, iii, dan iv | d) i, iii dan iv |

12. Bangsa-bangsa ini memainkan peranan penting dalam proses pengembangan Islam di Tanah Melayu **kecuali**:

- | | |
|----------|----------|
| a) Arab | c) China |
| c) Barat | d) India |

13. Menurut sumber China, orang Arab mula berada di Sumatera sejak abad

- | | |
|----------|---------|
| a) ke 7 | d) ke 3 |
| b) ke 10 | d) ke 9 |

14. Kedatangan Islam ke Tanah Melayu melalui India dikaitkan dengan tempat-tempat berikut:

- | | |
|--------------------|------------------|
| i) Mumbai | ii) Malabar |
| iii) Gujerat | iv) Bengal |
| a) i,ii,iii dan iv | c) i, ii dan iii |
| b) ii, iii, dan iv | d) i, iii dan iv |

15. Siapakan **sahabat Nabi SAW** yang pernah sampai ke Negara China?
- a) Abu Bakar
 - b) Saad ibn Abi Waqqas
 - c) Uthman Affan
 - d) Sulaiman Malik
16. Dari sudut **kosmologi**, pengaruh Islam di Tanah Melayu dapat dijelaskan melalui:
- a) pertukaran cara hidup nomad kepada hidup bertamadun.
 - b) perubahan sembah anismisme kepada konsep Tuhan yang Esa.
 - c) perubahan sistem pemerintahan beraja.
 - d) pembaharuan dalam kebudayaan dan adat.
17. Manakah antara berikut bukan merupakan Ahli Tetap Majlis Keselamatan PBB?
- a) United Kingdom
 - b) Jerman
 - c) Perancis
 - d) Russia
18. Mengapakah Tamadun Barat terlalu mudah meresap ke rantau Asia?
- i) Kesan globalisasi
 - ii) Kesan penjajahan yang lama
 - iii) Kesan pengaruh media
 - iv) Kesan Pegangan Agama yang kuat
- a) i,ii,iii dan iv
 - b) ii, iii, dan iv
 - c) i, ii dan iii
 - d) i, iii dan iv
19. Berikut merupakan kesan Globalisasi kepada muzik tradisional?
- a) Diterima oleh seluruh dunia
 - b) Semakin berkembang
 - c) Ditenggelami muzik barat
 - d) Disanjung oleh golongan muda

20. Malaysia merupakan anggota kepada pertubuhan berikut **KECUALI**
- | | |
|----------|--------|
| a) G7 | c) NAM |
| b) ASEAN | d) OIC |
21. Ibn Sina mengemukakan konsep ini bagi menerangkan '*projectile motion*':
- | | |
|---------------|-----------|
| a) mayl | c) Quwwat |
| b) al-harakah | d) Daya |
22. Apakah yang dimaksudkan dengan perkataan *Quwwat Al-Harakah*?
- | | |
|-------------|------------|
| a) momentum | c) tenaga |
| b) daya | d) Gerakan |
23. Berikut merupakan golongan penggerak ilmu Fizik dalam tamadun Islam **KECUALI**:
- | | |
|----------------------|---------------------|
| a) Golongan Falsafah | c) Golongan teologi |
| b) Golongan Gnostik | d) Golongan Seniman |
24. Manakah antara berikut menjelaskan pandangan ahli Gnostik terhadap Alam?
- | |
|---|
| a) Simbol untuk mengenali dan memahami tuhan |
| b) Sistem yang teratur dengan sendiri |
| c) Kajian untuk kehidupan dunia semata |
| d) Ciptaan yang tidak mempunyai apa-apa kepentingan |

25. Berikut merupakan antara kepakaran awal umat Islam dalam bidang kejuruteraan **KECUALI**:

- | | |
|---------------|--------------------------|
| a) Jam Air | c) Pengairan bawah tanah |
| b) Tenaga Wap | d) Tenaga Angin |

26. Berikut adalah pernyataan paling tepat berkenaan konsep perubatan Islam?

- a) Tanpa usaha penyakit tidak akan sembuh
- b) Doktor berkuasa menentukan tahap kesihatan pesakitnya
- c) Sakit dan Sihat dalam kekuasaan Allah
- d) Kesakitan hendaklah dihadapi dengan sabar tanpa ada usaha mengubatnya

27. Manakah antara berikut merupakan **falsafah perubatan Islam**?

- | | |
|----------------------------|-------------------------------------|
| i) Sakit untuk pelaku dosa | ii) Sihat Nikmat Daripada Allah |
| iii) Maut di tangan Tuhan | iv) Kebersihan sebahagian dari Iman |
-
- | | |
|--------------------|------------------|
| a) i,ii,iii dan iv | c) i, ii dan iii |
| b) ii, iii, dan iv | d) i, iii dan iv |

28. Berikut **bukan** merupakan sumbangan Al Razi kepada bidang perubatan:

- a) membezakan antara campak dan cacar
- b) menyediakan ubat daripada tumbuhan
- c) membahagi ubat kepada 3 kategori
- d) membina klinik

29. Berikut merupakan **sumbangan** Ibn Sina:
- a) Menerangkan hubungan antara urat dengan arteri
 - b) Mencipta pil, bedak dan salap
 - c) Menemui proses jangkitan TIBI
 - d) Menemui ubat kepada Demam Kuning
30. Berikut merupakan kata dasar kepada perkataan **JIHAD**:
- a) Yujahidu
 - b) Juhdun
 - c) Jahada
 - d) Jihadan
31. **PANGSIR, LAMRI, ARU dan PERLAK**. Kawasan-kawasan ini merupakan?
- a) Negeri-negeri Melayu lama menurut sarjana China
 - b) Tempat permulaan Agama Islam di Nusantara menurut buku Sejarah Melayu
 - c) Tempat penemuan sejarah-sejarah purba
 - d) Tempat penyebaran Islam di Nusantara menurut pandangan Marco Polo
32. Mereka bertanggungjawab menyebarkan **ISLAM di PERLAK**:
- a) Pedagang India
 - b) Pelayar Arab
 - c) Pemberontak Islam di China
 - d) Pemberontak Syiah
33. Kesan utama pengaruh Islam dalam bidang hiburan di Aceh dapat dilihat melalui:
- a) Alat-alat muzik Tradisional
 - b) Taman Ghairah
 - c) Tarian-tarian Tradisional
 - d) Cerita-cerita dongeng

34. Beliau dikatakan Raja mempunyai sikap yang terbuka dan merupakan pengasas kepada ajaran Din Ilahi:
- a) Genghis Khan
 - b) Akbar Agung
 - c) Maharaja Derbar
 - d) Ziyad bin Saleh
35. Manakah antara berikut merupakan contoh perbezaan antara tamadun dari sudut Teologi:
- a) Fahaman Reinkarnasi
 - b) Punyai Doktrin
 - c) Konsep Ketuhanan
 - d) Konsep Nilai dan Akhlak
36. Siapakah yang mula-mula memperkenalkan Konsep Islam Hadhari?
- a) Dr Yusuf Al Qardhawi
 - b) Tun Dr Mahathir
 - c) Datuk Seri Abdullah Ahmad Badawi
 - d) Khulafa Ar-Rasyidin
37. Semua berikut merupakan sebab Konsep Islam Hadhari diperkenalkan **KECUALI:**
- a) Membetulkan persepsi Barat terhadap Konsep Negera Islam
 - b) Melahirkan masyarakat Negara Islam yang maju
 - c) Memerangi negara-negara yang tidak menerima Islam
 - d) Membela nasib umat Islam di seluruh dunia
38. Bilakah Konsep Islam Hadhari ini mula-mula diperkenalkan?
- a) 2002
 - b) 2004
 - c) 2003
 - d) 2005

39. Semua berikut merupakan perjanjian yang pernah dimeterai pada zaman Rasulullah SAW **KECUALI**:
- a) Perjanjian Ibadah
 - b) Perjanjian Hudaibiyah
 - c) Perjanjian Aqabah I
 - d) Perjanjian Aqabah II
40. Berikut merupakan beberapa perkara utama yang dilakukan oleh Nabi Muhammad selepas tiba di Madinah **KECUALI**:
- a) Membina Masjid
 - b) Mewujudkan Piagam
 - c) Mempersaudarakan orang Islam
 - d) Memerangi Orang Kafir
41. Perkataan *Hadhari* diterbitkan dari perkataan *hadara* (حضر) yang membawa maksud:
- a) Kampung
 - b) Hadir
 - c) Tamadun
 - d) Sopan
42. Manakah antara berikut istilah yang tepat bagi Islam Hadhari menurut bahasa Arab:
- a) Al Islam Al Hadhari
 - b) Al Islam Hadhari
 - c) Islam Hadhari
 - d) Islam Al Hadhari
43. Manakah antara berikut **TIDAK BENAR** berkenaan Islam Hadhari:
- a) Mula-mula diperkenalkan oleh Malaysia pada 2004.
 - b) Bukan merupakan mazhab Islam yang baru
 - c) Mengubah sebahagian kecil syariat di dalam Islam
 - d) Tidak mempengaruhi konsep Aqidah Islam

44. Visi Konsep Islam Hadhari adalah:
- a) Menjadikan Malaysia Negara Islam Contoh
 - b) Menjadikan Malaysia Negara Maju Menjelang 2020
 - c) Menjadikan Agama Islam Kuasa Dunia
 - d) Mempastikan Malaysia Sentiasa Dikenali di Seluruh Dunia
45. Antara berikut, yang manakah **BUKAN** merupakan misi Islam Hadhari?
- a) Membangunkan negara berlandaskan ajaran Islam yang Progresif
 - b) Membangun ummah dengan ketamadunan
 - c) Menghapuskan semua musuh-musuh Islam
 - d) Melahirkan Masyarakat yang seimbang
46. Prinsip-prinsip Islam Hadhari bertepatan dengan prinsip Maqasid Al Syariah yang bertujuan memelihara perkara-perkara tersebut **KECUALI**:
- a) Akal
 - b) Nyawa
 - c) Harta
 - d) Negara
47. Manakah antara berikut **BUKAN** merupakan Prinsip Islam Hadhari?
- a) Kehidupan Sihat
 - b) Rakyat Berjiwa Merdeka
 - c) Kekuatan Peperangan
 - d) Pemeliharaan Alam Semulajadi

48. Prinsip Islam Hadhari yang pertama ialah?
- a) Penguasaan Ilmu Pengetahuan
 - b) Kerajaan Adil dan Amanah
 - c) Keimanan dan Ketakwaan kepada Allah
 - d) Kepercayaan kepada Tuhan
49. Kerajaan Adil dan Amanah. **Adil** membawa maksud?
- a) Pembahagian yang seimbang
 - b) Persamaan hak antara semua umat
 - c) Memberikan yang hak kepada mereka yang berhak
 - d) Membela golongan kurang bernasib baik
50. Keimanan dan ketakwaan kepada Allah menjelaskan perkara berikut **KECUALI**:
- a) Iman dan Taqwa teras agama Islam
 - b) Tiada paksaan dalam menganut agama
 - c) Konsep Islam Hadhari bertunjang paksi keagamaan
 - d) Semua rakyat Malaysia mestilah Islam
51. Sebutkan prinsip Islam Hadhari yang membela hak-hak wanita?
- a) Kehidupan Berkualiti
 - b) Pembelaan Hak Kumpulan Wanita
 - c) Pembelaan Hak Kumpulan Minoriti dan Wanita
 - d) Pembelaan Hak Semua Rakyat

52. Semua berikut merupakan tumpuan Islam Hadhari **KECUALI**:
- a) Pembangunan Ilmu
 - b) Pembangunan Peperangan
 - c) Pembangunan Pertanian
 - d) Pembangunan Kesihatan
53. Manakah **bukan** merupakan tindakan Kerajaan Malaysia bagi merealisasikan Konsep Islam Hadhari?
- a) Menjadikan tahun 2006, tahun pelaksanaan
 - b) Mengadakan siri penerangan sejak tahun 2005
 - c) Menyadur fahaman Islam dari Barat
 - d) Mewujudkan jawatankuasa pelaksana di semua negeri dan kementerian
54. Prinsip Rakyat Berjiwa Merdeka menyeru masyarakat Malaysia menjadi:
- a) Rakyat yang pasif
 - b) Pejuang Kemerdekaan
 - c) Rakyat yang hidup bebas tanpa batasan
 - d) Rakyat yang inovatif
55. Mengapakah Islam Hadhari diperkenalkan oleh YAB Perdana Menteri?
- a) Melawan fahaman-fahaman barat
 - b) Mengislamkan seluruh masyarakat Malaysia
 - c) Mengubah persepsi masyarakat terhadap Islam khususnya di kalangan umat Islam
 - d) Memajukan Negara mengikut contoh negara-negara maju yang lain

56. Menurut Ibn Khaldun, kemerosotan tamadun disebabkan oleh?
- a) Kelemahan pentadbiran
 - b) Peperangan
 - c) Putaran Sejarah
 - d) Kelemahan Manusia
57. Manakah antara berikut **bukan** merupakan faktor kemunculan tamadun?
- a) Kesengsaraan Hidup
 - b) Kedudukan tersembunyi
 - c) Faktor Ekonomi
 - d) Politik stabil
58. Tahap Peningkatan Tamadun dapat dilihat melalui dua asas utama iaitu:
- a) Fizikal dan Intelektual
 - b) Infrastruktur dan Fizikal
 - c) Material dan Mental
 - d) Spiritual dan Emosi
59. Dalam permulaan sejarah Negara Islam, orang bukan Islam dikehendaki membayar?
- a) Zakat
 - b) Jizyah
 - c) Jihad
 - d) Cukai Pintu
60. Susunkan peringkat-peringkat Tamadun Islam di Tanah Arab?
- i) Zaman Khulafa Ar-Rasyidin
 - ii) Zaman Rasulullah
 - iii) Zaman Bani Umayyah
 - iv) Zaman Bani Abbasiyah
- a) i, ii, iii, iv
 - b) iv, i, iii, ii
 - c) iii, ii, iv, i
 - d) ii, i, iii, iv